Global economic crisis and technological innovation: any interaction?

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Introduction

Our world has endured already several crises in the areas of health, food, energy, climate. Technological innovation is not at the origin of any of them but all of them have created a strong demand for more knowledge and more technological innovation

Will the pattern be the same for the current economic crisis? The answer is a difficult one due to an element of emotion and irrationality in today's behavior of our Society. Can we at least learn something from history?

Lessons from History (1)

Experience acquired during past crises (The great depression of 1929, the Japanese economic bubble of the late 1980’s, the collapse of the Soviet Union in the early 1990’s and the ICT bubble of the 2000’s) can only be of limited significance as the current crisis is much more significant in terms of losses: in less than a year, around 30 Trillions $ have gone up in smoke, twice the US GDP. Nevertheless, it is worth being analyzed

Lessons from History (2)

The Great Depression of 1929 which started in the United States but affected also other economies, occurred at a time when the coupling between society, S&T and innovation was weaker. Nevertheless, people claim that it was in the early 1930s, that 3M developed Scotch tape, GE introduced the fluorescent light bulb, and that Hewlett-Packard was founded. It is probable that this crisis provided a stimulus for entrepreneurship and creativity

Lessons from History (3)

The bubble of the Japanese economy of the late 1980s (*baburu keiki*) has some similarity with the current crisis (real estate bubble, build up of a large financial debt). It affected essentially Japan itself: after substantial growth in the early 1980's, the Japanese economy stagnated since then, and a fall of the annual GDP growth to minus 5.4% is predicted in 2009. The impact on technological innovation was not deeply felt, even if R&D spending was affected

Lessons from History (4)

What about the economic crisis of the early 1990's which followed the dissolution of the Soviet Union? Its origin was essentially political, it created a significant and lasting recession in all the successor states: Russia's GDP dropped by 45% between 1989 and 1998, Georgia and Moldova recorded losses of 65% to 75% of their earlier GDPs. For all CIS countries, the average fall over a decade was roughly 50%. Such losses in GDP in so many countries have no equivalent in recent times

Lessons from History (5)

What are the lessons to be learned about the evolution of the R&D and Innovation under such drastic conditions?

- The crisis has shown the extreme resilience of R&D systems to adversity, provided they are strong initially and the hardship is not indefinite
- Any crisis underlines the need for change in the technological innovation paradigm, something that most CIS countries have to still to implement

Lessons from History (6)

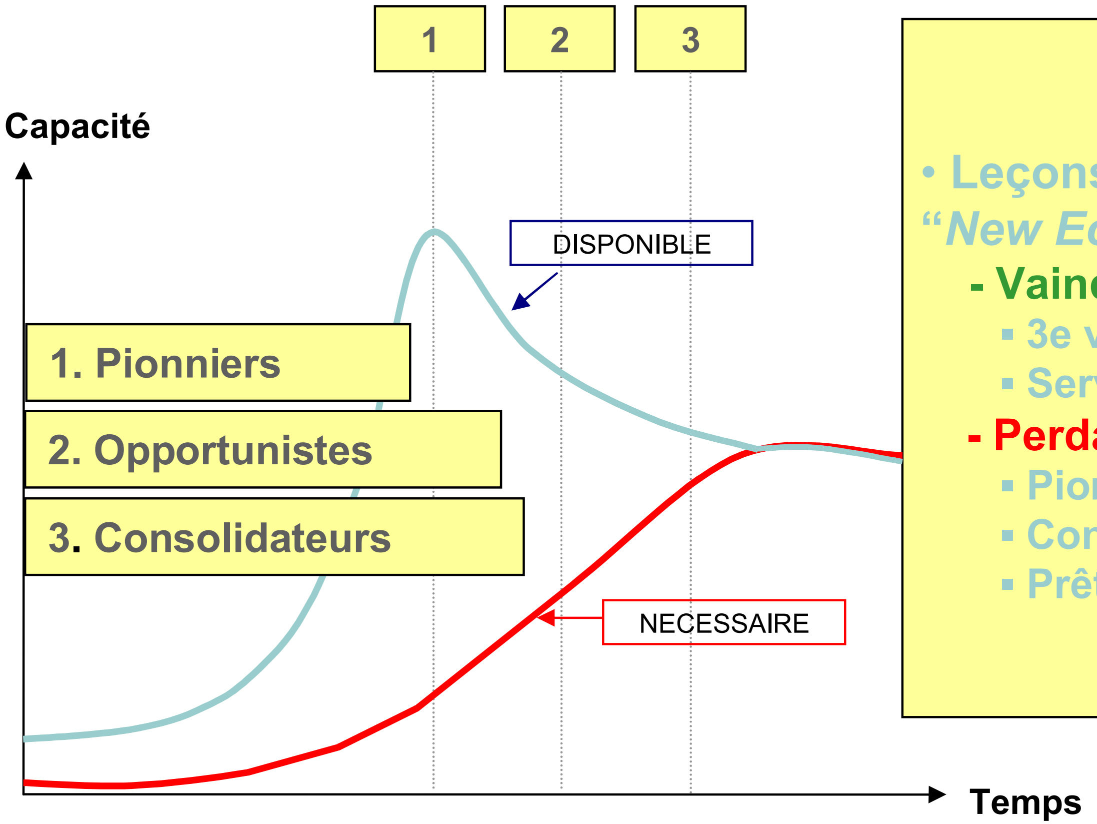
The ICT bubble of the late 1990's affected mostly the United States. The losses were quite extensive; in 2002, of the 180 Billion $ of debt defaulted worldwide, 46% were due from companies in the business related to telecommunications. WorldCom alone accumulated a loss of 73.7 B$ in the last three years. The bubble impacted on the global economy through the weight of ICT's in GDP: 3 to 5% for Europe and 4 to 7% for the US

Lessons from History (7)

Even if the ICT bubble was of restricted scale, it was nevertheless the clear sign of the increased coupling between technology and economy. It produced a few lessons about how <u>not</u> to behave when using technological innovation, i.e. pouring large sums of money in technological infrastructures with the expectation of large returns when the need for such infrastructures is still lagging, as Geert Noels as shown in the following figure

Le Cycle typique des surinvestissements

«Boom/bust» et redressement



- Leçons des anciennes "*New Economies*"
  - Vainqueurs
    - 3e vague
    - Services
  - Perdants
    - Pionniers
    - Constructeurs d'infrastructures
    - Prêteurs

Lessons from History (8)

In such a case, the financial investments in technological innovation have followed the wisdom of the Gospel:

> "*So the last shall be first, and the first last: for many be called but few chosen*"

Lessons from History (9)

This brief analysis shows that only a few lessons emerge from past crises:

- A trend towards more creativity and entrepreneurship
- The resilience of any R&D system to adverse financial conditions for a limited period of time
- The need for adjusting the technological innovation paradigm after an economic crisis
- The danger of investing heavily in new technological infrastructures when the demand is still dormant

The current situation (1)

For the current crisis, two factors can be underlined:

- Technological innovation did not contribute to the initiation of this crisis, at least directly
- A strong technological innovation system is not sufficient for protecting any country against the economic crisis, as shown by the poor performance of leading innovators. Will the strength in technological innovation help in the recovery phase? This remains to be seen

The current situation (2)

The following table gives for the top 10 world innovators ranked by the Economist Intelligence Unit for the period 2004-2008:

- The forecasted annual change in real GDP in 2009 given by the IMF (For advanced economies, the average is minus 3.4%) .
- The corresponding ranking in the IMD 2009 “Stress Test on Competitiveness”, an analysis of which countries are better equipped to fare through the crisis and improve their competitiveness in the near future

	J	CH	FIN	US	SE	D	TW	NL	IL	DK
GIR 2004/ 2008 Econ.IU	1	2	3	4	5	6	7	8	9	10
Loss GDP 2009	-5.4 %	-2.0 %	-6.4 %	-2.7 %	-4.8 %	-5.3 %	-4.1 %	-4.2 %	-0.1 %	-2.4 %
GSI IMD	26	6	9	28	7	24	21	11	20	1

For Portugal, the corresponding figures are as follows:

- Global Innovation Rank: 33rd rank (after Greece, before South Africa)
- Annual change in real GDP 2009: -3.0%
- Stress Test: 42nd rank (before France 44th, Spain 50th)

The current situation (3)

The table confirms that a strong innovation system does not protect these leading countries for significant losses in GDP and that there is no clear correlation in terms of prospects of recovery. IMD attributes the good position of the smaller countries in the Stress Test to the fact that they are export-oriented, resilient and with stable socio-political environments, hence better equipped to benefit immediately from the recovery

The current situation (4)

If one uses other global innovation rankings such as:

- The Global Innovation Index of The Boston Consulting Group, together with the National Association of Manufacturers and the Manufacturing Institute
- The Global Innovation Index of the INSEAD Business School, together with the Confederation of Indian Industry,

the results are not basically different, as shown in the following tables

	SG	KR	CH	IC	IE	HK	FI	US	J	SE
GII BCG 2008	1	2	3	4	5	6	7	8	9	10
Loss GDP 2009	-3.3 %	-1.0 %	-3.0 %	-4.4 %	-3.3 %	-1.0 %	-3.0 %	-2.4 %	-5.4 %	-4.2 %
GSI IMD	2	29	6	<57	25	5	9	28	26	7

	US	D	SE	UK	SG	KR	CH	DK	J	NL
GII 2008/ 2009 INSEAD	1	2	3	4	5	6	7	8	9	10
Loss GDP 2009	-2.7 %	-5.3 %	-4.8 %	-4.4 %	-3.3 %	-1.0 %	-3.0 %	-2.4 %	-5.4 %	-4.2 %
GSI IMD	28	24	7	34	2	29	6	1	26	11

What about the future? (1)

In innovation, the present does not exist, what counts is the future. In spite of the large uncertainty about how the system will react, some dominant features of the future evolution could be delineated:

- *The priority allocated to demand driven innovation*
- *The pressure for more organizational innovation*

What about the future? (2)

- *The missed opportunity of public intervention*
- *The future role of neglected innovators*
- *A new world map of innovation*

Priority to Demand Driven Innovation (1)

The most obvious effects of the current economic crisis are the decrease in public and private revenue, the reduction in domestic consumption, the scarcity of available banking credit, the growing unemployment, a stronger involvement of the State in the management of the economy and a perceptible change in social behavior

Priority to Demand Driven Innovation (2)

The change in social behavior might not appear so obvious but it is real: periods of crisis are often linked with repentance, search for responsibility, a strive towards the respect of ethical values

The combination of such ethical behavior with the slowing down of the economy leads to concentrating on essential needs; utilitarian aspects of innovation are favored, getting away from technological gadgets

Priority to Demand Driven Innovation (3)

The sectors of ICT’s and of consumer electronics which were strong proponents of technology pushed innovation are affected by this evolution. They become more shopper-friendly, promoting applications with a social content, green technologies, less demanding software applications (Windows 7, Snow Leopard)

Software firms, producers of electronic equipment, even chip producers, feel more the impact of the crisis than biotechnology firms driven essentially by the demand in the health and agricultural sectors

Priority to Demand Driven Innovation (4)

"There is an unhealthy focus on products that sell to advisers, rather than ones clients need" (FT, September 28, 2009)

Demand will confirm its position as primary driving force for innovating in the industrial sector

Priority to Demand Driven Innovation (5)

This does not mean that technology pushed innovation will no longer be needed, it remains the engine of change in the market and therefore an element of progress in our Society. It satisfies unsaid or hidden demands. After having gone too fast, too far in the past decades of strong economic growth, it should find a point of equilibrium in the overall innovation system

More Organizational Innovation (1)

Even if it is aimed at realizing ultimate financial savings, the introduction of new products and processes requires large immediate investments with financial returns situated in the future. This constitutes an obstacle in times of credit crunch. Organizational innovation is largely immaterial, it does not need such large investments and hence it would be privileged. Periods of crisis bring more creativity

More Organizational Innovation (2)

The crisis should be an opportunity for looking at structural reorganizations and new partnerships, for entering into technological fields complementary to the traditional technology base, for revising some technological and industrial paradigms e.g. favoring open source software or reviewing “just in time” production

More Organizational Innovation (3)

Open source software and more generally open source services respond positively to tight financial situations, when operational expenditure is preferred to capital expenditure and when people have more time than money. “Cloud computing” will become increasingly appealing for individuals and enterprises as it will allow to pay a little for using someone else’s enormous capital investment

More Organizational Innovation (4)

Just-in-time production was a brilliant concept which propagated to many sectors of industrial production; it was introduced by Toyota at a time of high interest rates, less frequent extreme climatic events and a lower level of social unrest. The context has changed, should the paradigm change accordingly?

More Organizational Innovation (5)

Jean-Marc Vittori ("L'effet sablier, vers la mort des classes moyennes") suggests that consumption in our Society will be concentrated in the future on both cheap and very costly products, products of intermediate quality being progressively abandoned. If this were verified, it would impact on organizational innovation

A deeper reflection about the opportunities of organizational innovation in crisis time should be launched

Public Intervention (1)

All governments have intervened heavily in the tackling of the crisis. They have started with emergency actions in the financial field, controlling bailouts, providing State guarantees, becoming shareholders of financial institutions, all actions with little or no relevance to innovation

Public Intervention (2)

Nearly all of them have subsequently initiated stimulus packages, some of large size such as the US package of nearly 800 Billion dollars. What could be the impact of such packages on innovation? The answer to this question is so far disappointing, most stimulus packages yielding to the temptation of financing "shovel-ready projects" (Barack Obama) following the recipe of Keynes of the 1930's, leaving little place for innovation

Public Intervention (3)

Urgency appears to have been the dominant factor. The crisis has immediate effects, quenching those effects needs an immediate response that innovation does not offer necessarily.

What can be used is today’s innovation based on yesterday’s R&D; there is no time to enter into new cycles of innovation to meet the most pressing needs

Public Intervention (4)

An opportunity which has not been sufficiently exploited and which could still be used resides in the promotion of infrastructural projects with some degree of innovative content within public procurement measures. Public procurement constitutes a strong engine of innovation.

Sustainability is an important item of public and private agendas. "Sustainable Keynesianism" could be a way forward

Public Intervention (5)

This corresponds to the use of public funds for investments not only in infrastructures but also in services which present a sustainable character. Sustainable manufacturing plants, sustainable transport infrastructures, sustainable urban management, sustainable energy sources and distribution systems, sustainable buildings, sustainable chemistry plants, sustainable farming areas and sustainable water management fall in this category

Public Intervention (6)

In general, favoring new or accelerated investments in the energy and environmental sectors could create new outlets for available innovative products, processes and services, leading then to an increased demand for fresh innovation and for more knowledge creation

Public Intervention (7)

If the political will exists, win-win situations can be developed. The main obstacles are constituted by:

- The pressure for saving traditional sectors with large workforces of limited capability for redeployment, such as in the automobile and the steel industries
- The denial of bank finance to innovative manufacturers
- The rampant protectionism as the "Buy American" provisions of the 2008 US stimulus package

Public Intervention (8)

So far, public intervention has not been favoring innovation. The orientation which will be given to future public intervention is a key element in the long term development of innovation, which will, in turn, determine the pattern for structuring the knowledge base of the years to come

Neglected Innovators (1)

Within technological innovation, there are several models which can be followed by national systems and by enterprises, depending on the driving force (technology push or market pull), the type of knowledge (internal or external) and the type of market (internal or external)

Neglected Innovators (2)

One such model relates to “neglected innovators”, called also “non R&D innovators”, relying on an external knowledge base (no internal R&D) and oriented generally towards external markets. This model has grown in importance. According to the European Innovation Scoreboard 2008, in the EU 27, 52.5% of the innovative firms fall in this category, as opposed to 40% performing R&D in-house

Neglected Innovators (3)

A large fraction of these “neglected innovators” have less than 50 employees, are active in low technology service sectors and are located in countries with below average innovative performance. They work generally in an isolated fashion, with no collaboration, internal or external

Neglected Innovators (4)

They are in the short term vulnerable to the crisis but in the longer term they should offer new opportunities in innovation in most countries:

- They display a certain preference for process innovation, a type of innovation which could experience now a marked slowdown through the lack of investments but could get a new impulse in the future through increased demand in certain sectors

Neglected Innovators (5)

- The general economic climate, notably the credit crunch, constitutes a brake. Venture Capital in particular is much harder to obtain but the situation could be reversed with stronger public stimulus
- Increased collaboration could reduce the vulnerability. Public agencies and industrial federations should assist in reinforcing the networking of such innovators. Again partnership is a keyword

Neglected Innovators (6)

The future of “neglected innovators‟ constitutes an important issue. Their development would reinforce the tissue of SMEs and could be an opportunity for emerging and fast developing countries with too little time for building a knowledge base. It requires increased attention from business and public authorities

A New World Map of Innovation

The current economic crisis will aggravate the situation of those nations absent from, or quite weak on, the innovation scene. The gap between the mightiest in innovation and the weakest will deepen

But the crisis offers new opportunities to emerging countries with enough financial resources for becoming new entrants on the innovation scene. A new world map of innovation will most probably emerge, with a more balanced distribution. Will Africa seize this opportunity?

In Conclusion (1)

It is said that the 20th century began in August 1914 and finished in November 1989; will the 21st century really begin in October 2008?

Whatever the outcome of the crisis, it will have a long lasting effect on the innovation system. In the dynamic scenario which everyone wishes to see implemented, this system should not lose its role as engine of economic growth but it should emerge restructured and more attentive to Society's needs

In Conclusion (2)

The recovery from the crisis should reinforce the "inverse" innovation chain, i.e. Societal Demand – Innovation - R&D, leading to a further forsaking of the classical linear model of the 20th Century, i.e. R&D – Innovation – Market

Knowledge creation should benefit from this restructuring but should resist the temptation of becoming too utilitarian. A broad knowledge base remains essential for our future

In Conclusion (3)

Our Society has experienced a period of "irrational exuberance". Let us hope that it will not enter in a period of "irrational pessimism" and that the global crisis could be seen by decision-makers as an opportunity for revising some of the current innovation paradigms

Thank you for your attention!