iKnow* News n° 1

interconnecting Knowledge

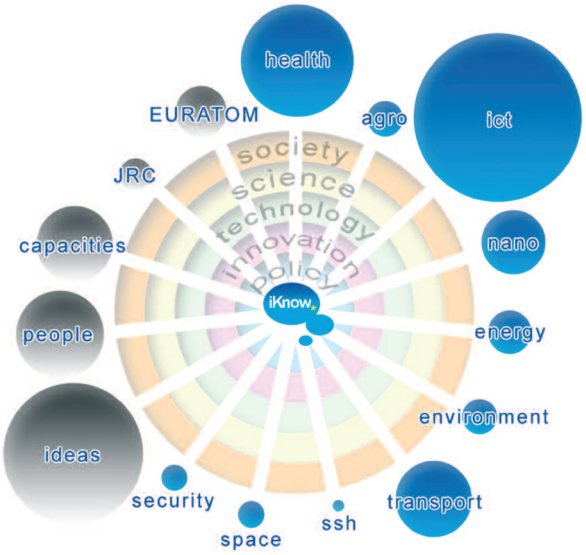
September 2009

Introduction to iKnow

By Rafael Popper, Manchester Institute of Innovation Research (UK)

iKNOW is a new project launched by the European Commission. It aims to advance knowledge and tools related to events and trends potentially shaping - and shaking - the future of science, technology and innovation (STI). The project is funded by the Directorate General for Research, as part of its Blue Sky initiatives, which are designed to create more proactive European research policy that will be capable of anticipating emerging issues, wild cards and weak signals (WI-WE).

iKNOW intends to become a cornerstone for foresight and futures studies in Europe - advancing knowledge, tools and capacities for the analysis and use of WI-WE approaches.



The outer ring of this image shows the 15 specific programmes of the EC FP7 with the size representing the allocated funding, e.g. €9,110 million for ICT research and €610 million for social sciences and humanities (SSH) research.

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Coming up ...

Finnish WI-WE National Workshop

Helsinki, 1-2 December 2009

The first of four national workshops will take place in Finland on the themes of: *Food, Agriculture, Fisheries and Biotechnology, Energy* and *Security.* The workshop aspires to capture the state-of-the art of the sectors and related WI-WE. For more information, please contact Tuomo Kuosa at FFRC, *tuomo.kuosa@tse.fi*

iKnow Consortium Management Meeting

Helsinki, 3 December 2009

A consortium management meeting will follow the first national workshop. The meeting aims to evaluate the progress of the project and in particular prepare the agenda for 2010. Please contact the iKNOW project coordinator, Rafael Popper, *rafael.popper@manchester.ac.uk*

UK WI-WE National Workshop

Manchester, February 2010

The second iKNOW national workshop will be held in the UK, focusing on the *Environment, Nanotechnology* and *Social Sciences and Humanities.* More information will be available in the next edition of the newsletter. For early information, please contact Anthony Walker at RTC North, *anthony.walker@rtcnorth.co.uk*

Editorial

By Rafael Popper, Manchester Institute of Innovation Research

Rafael Popper

We have already witnessed many surprising changes in this new century; some driven by natural forces (tsunamis, earthquakes) and others by planned human actions (terrorism , Web 2.0) or the unplanned consequences of human actions, such as the recent financial crisis. Despite a history consistent in such unexpected changes, we remain incapable of adequately preparing for and responding to them.

In response to this incapacity, there has been a growing number of coordinated efforts using foresight to develop long-term agendas. Some of these successfully combine the three pillars of foresight approaches: prospective and forward-looking; participatory and networking; and strategy- and policy-making. However, even with these efforts, too little attention has been paid to Wild Cards and Weak Signals (WI-WE).

Wild Cards are events that have a low perceived probability of occurring but a high potential of causing major impacts if they were to occur. Wild Cards are often presented as negative events but they can be positive too, for instance, by signalling a paradigm shift as in the work of Copernicus, or a scientific breakthrough like Einstein's Theory of Relativity or the digital revolution caused by the Wold Wide Web. Weak Signals, on the other hand, are unclear yet observable warnings about the probability of future events (including Wild Cards). Weak Signals implore us to consider alternative interpretations of an issue's evolution to gauge its potential impact.

With these ideas in mind, we believe there is a strategic need to develop methodologies to identify, analyse and use WI-WE. Defining these frameworks constitutes one of the research lines of the iKnow Project. The other explores and assesses WI-WE of particular relevance for Europe's research programmes, Grand Challenges, and key policy targets linked to the European Research Area (ERA) vision. ■

Introduction to **iKnow**

Our team

iKNOW has built a consortium of eight partners: six organisations with high-level expertise in foresight, technology transfer and STI policy advice (Manchester Institute of Innovation Research, Finland Futures Research Centre, Z_punkt, RTC North, Technology Centre of the Academy of Sciences and the Interdisciplinary Centre for Technology Analysis and Forecasting) and two IT companies with significant software development and web design experience (Mindcom and Cyber Fox).

Our first objective

iKNOW will compile and analyse existing world-wide literature on WI-WE. This review will contribute to a better understanding of the importance of using WI-WE appraisals in forward-looking activities, foresight, strategic planning and futures studies. iKNOW will also develop interactive Web 2.0 platforms (WI-WE Bank and WI-WE Scan) capable of capturing WI-WE intelligence, and connecting expert knowledge through structured discussions on the potential implications of WI-WE analyses for Europe and the world.

These platforms will be supported by the iKNOW Community – an interactive virtual space aimed to facilitate dialogue among researchers and policy-makers on a range of themes, including health, agriculture, ICT, nanoscience, energy, environment, transport, social sciences, space and security, among others.

Access to these platforms will be available to foresight practitioners (in cooperation with the European Foresight Platform) and other organisations involved in activities supported by the EC Framework Programmes for Research and Technology Development. This will contribute to the Commission's goal of building an 'early-warning system' capable of providing sound and strategic information to researchers and policy-makers, thus generating timely debates on future challenges and opportunities for science, technology and innovation.

By Rafael Popper, Manchester Institute of Innovation Research (UK)

Our second objective

iKNOW will locate and classify WI-WE that are particularly relevant to key dimensions of the European Research Area (ERA) vision (i.e. mobility, infrastructures, institutions, knowledge sharing, Joint Programming, and international S&T cooperation) and 'Grand Challenges' (e.g. water and energy vulnerability, diseases, sustainable development, ageing and demographic tensions).

Our activities and expected outputs

We will use three major mechanisms to achieve our objectives:

- Structured and continuous scanning of WI-WE with the help of Web 2.0 applications. The scanning will initially be carried out by project partners. Once the WI-WE database has achieved a substantial number of high quality entries, the scanning process will be opened up to a larger group of experts.
- Organisation of surveys, interviews, and a cross-national Delphi to gather EU and international views on WI-WE. These activities will be followed by four national surveys and workshops looking at potential impacts of WI-WE on national and sub-national issues. The national dimension will be used to prepare case studies to contextualise findings and develop an in-depth understanding of how WI-WE relate to national and regional policy issues, in particular those related to major pan-European goals.
- Validation and dissemination of findings through WI-WE bulletins, policy toolkits and practical guides aimed at supporting policy-makers and the foresight community.

The activities and results of the project will be disseminated through dedicated working and communication Web Portals, such as the WI-WE Bank, WI-WE Scan and the iKNOW Community available at *www.iknowfutures.eu* (also available at ~.com and ~.net).

Members and visitors of the iKNOW Community will be able to explore:

- WI-WE relevant to ERA, FP7 themes and selected Grand Challenges
- Videos related to selected WI-WE
- Short bulletins on selected WI-WE
- Electronic version of the project Newsletters
- Articles, Blogs, Members and Groups of the Community

Members and visitors of the iKNOW Community will be able to share:

- WI-WE related to their own publications
- WI-WE related to their own research projects
- Views on WI-WE relevant to ERA, FP7 Themes and Grand Challenges

iKnow* interconnecting Knowledge

The iKNOW database and tools will bring together knowledge and information from academic, policy and business sectors. This edition of the newsletter introduces the project and opens the discussion on wild cards and weak signals (WI-WE) with a note from the editor, a report from the pilot workshop, a featured interview, a glance of literature review, an opinion, and a short description of upcoming events. ■

By Aharon Hauptman ICTAF, Israel

Taming wild cards and identifying weak signals affecting the European Research Area

The iKNOW project conducts interviews with experts in science and technology, EU research policy, and foresight. The aim of these interviews is to enrich participation in the project and to broaden our exposure to different ways of thinking about Wild Cards and Weak Signals. Aharon Hauptman, from iKNOW partner group the Interdisciplinary Center for Technology Analysis and Forecasting at Tel-Aviv University, interviewed Dr. Olivier Da Costa, a Project Officer at the European Commission/DG Information Society. Dr. Costa has a PhD in plasma physics from the École Polytechnique, and has expertise in foresight, converging technologies (nano-, bio- and info-technologies and cognitive science) and science and technology roadmapping.

Can you envision major wild cards, positive or negative, that may occur in the next 20 years? Which ones are particularly relevant to research in the EU and/or may dramatically affect the ERA?
The major trend in the next 20 years is global warming- its consequences for ecosystems, economies and societies, as well as the reactions of societies and countries to mitigate it or to deal with its effects.
Wild cards with major consequences could be the rapid acceleration of global warming; the breakdown of China between runaway Xinjiang and Tibet; social unrest; famines and lack of water; environmental disasters; the paralysis of the EU, or even worse its disintegration as a consequence of an economic crisis and the unsustainable level of debt of some countries. The paralysis, or break-down, of the EU, would have major consequences for the ERA.
Otherwise I think that European research and research policy are doing well, despite their shortcomings. But they may be threatened by things like a growing disaffection of young people for research, science and technology and restraints on the freedom to move between countries.

What would be the impact of the wild cards you mentioned, and how should these be addressed by research?
Rapid acceleration of global warming, which could be amplified by the melting of the ice sheet and/or the unfreezing of the permafrost, would be disastrous with major ecological and social consequences. A lot of research on the dynamics of the atmosphere and seas, on the behavior of polar ice, on the permafrost, and on monitoring capabilities is needed.
The consequences of a breakdown of China are difficult to foresee but would certainly be major for the global economy, for the US, and for the rest of the world. More research is needed to understand what is going on in China, as well as in other parts of the world, like the Muslim countries.
If the EU were to break down, the consequences would be disastrous.

What are the weak signals that, if detected, could hint at a growing likelihood of the wild cards that you mentioned?
A weak signal of the coming paralysis of the EU, or even worse its breakdown, would be the growing reluctance of the economically-virtuous countries (e.g., Germany) to fund the growing level of debt of less-virtuous countries and to engage into further and deeper European cooperation.

Can you identify any causal relationships between the Wild Cards or Weak Signals you mentioned? Which of them should be given top priority in EU research?
Global warming, the penury of resources, the economic crisis and a potential breakdown of the EU are all related to a collapse of an unsustainable economic model and society based on exponential growth.
For the EU, the top priority is research on global warming. In particular, the focus should be how to measure and mitigate it.

What are the most pressing emerging issues in the EU that are insufficiently addressed by current research?
Research on energy is weak: it does not take all the supply chain into account. For instance, the European Commission has intensively promoted the development of agro-fuels only to find out that it increased the shortage of cereals and therefore the lack of food worldwide.

Are there interesting lessons from previous foresight studies that employed the WI-WE approach?
I have read many foresight studies but I am often disappointed. Overall I think that the Millennium Project in the *"State of the Future"* is doing the best job in providing a complete overview, even if I find it often overly optimistic in its belief that humanity can react quickly and efficiently.

What are the best methods to identify Wild Cards and Weak Signals?
Shaping Tomorrow is doing the best job. I believe that the future of Foresight and Future Studies is in well-organised and moderated networks, not in individual undertakings. ■

Dr. Olivier Da Costa

Will the economic crisis break resistance **towards open innovation?**

By Martin Fatun and Michal Pazour, Technology Centre ASCR, Czech Republic

"Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology."
(Henry Chesbrough, Open Innovation: Researching a New Paradigm (Oxford, 2006)

Much has been written about the role of Science, Technology & Innovation (STI) in these trying economic times. A number of analyses have come out concerning initiatives adopted in support of STI in individual countries. One such study recently published by the United Nations Economic Commission for Europe (UNECE)[1] discusses open innovation as a potentially effective tool for the support of STI.

Wild Card that Pushes Ahead

In the past, R&D meant an important strategic advantage for established firms that prevented new players from easily accessing their markets. Individual industries used to be dominated by only a few large companies with developed R&D departments (e.g. DuPont, IBM, AT&T). However, the phenomenon of open innovation has been asserting itself, mainly in the area of ICT, since the 1980's. This phenomenon took many companies by surprise despite the fact that there had been signals – both weak and strong – drawing attention to the change; such as the significant growth in the numbers and mobility of knowledge workers which has made it difficult for large firms to control their intellectual property, or the rapidly growing availability of private venture capital which has made it easier to finance new companies capable of flexible realisation of innovations that would otherwise remain unused in the laboratories of big firms.

The open innovation concept has proven sustainable, even though it has been painful learning for a number of ICT companies. A classic example is Xerox and its Palo Alto Research Center (PARC) which had given birth to a number of innovative computer technologies in the 1970's– such as the Ethernet or the graphical user interface (GUI) – inventions that Xerox failed to make use of in its printer and copy machine oriented business. Other companies, such as Apple Computer and Microsoft, were able to benefit by utilising the GUI concept in their operating systems.

Open innovation then took the world of ICT by storm with the advent of open source software. In other industries, however, its progress towards a dominant position is hampered by certain circumstances. The current economic crisis could, however, significantly help with pushing this paradigm ahead.

Recession through Company Eyes

Innovation strategies may differ during a period of economic recession. While some companies react to poor economic conditions by limiting investments in projects with longer return time frames, others strive to lower operation costs (through reorganisation, for example) and at the same time increase the speed of investments in innovation projects in order to secure a competitive edge in the future. This variety of reactions to the economic downturn with regard to R&D and innovation prompted a survey conducted by the Technology Centre ASCR on a sample of selected companies operating in the Czech Republic.
Results of the survey indicate that 32% of enterprises expect to lower their R&D expenditures in 2009, with only 16% having lowered their spending in 2008. Conversely, only 14% of the respondents have declared their intent to increase their R&D spending, whereas 34% increased their investments in 2008. It is a positive sign that over a half of the queried businesses expect a stable development of R&D spending in 2009. With regard to cost reductions, businesses attempt to limit their investment and administrative costs first, then tax costs, and only after that educational and R&D costs. It is clear that the respondents consider R&D a key, strategic activity that will ensure their future competitive advantage.

Equal Chance for All

Resources are scarce in this time of crisis, especially for small businesses. While big players survive and prepare for revitalisation, small firms often struggle to survive and have no strength left for R&D. These companies might benefit from open innovation by joining forces, utilising external resources, and gaining access to new technologies and processes, and at the same time ensuring the practical application of R&D results. The government has a chance to support communication and knowledge transfer in multi-stakeholder ventures, and match-making for potential partners. Broad political and legislative support for this paradigm should convince those still hesitant companies of the benefits of the open innovation model. ■

1 Promoting innovation and knowledge-based development in times of crisis: What room for an active policy stance? United Nations Economic Commission for Europe, Committee on Economic Cooperation and Integration. Fourth session, Geneva, 28-30 September 2009, Item 2 of the provisional agenda.

Pilot Workshop: *Exploring interactive approaches to deal with Wild Cards and Weak Signals*

By Anthony Walker (RTC North, UK) and Joe Ravetz (University of Manchester, UK)

On 16th June 2009, the iKnow project hosted a pilot workshop – 'Wild Cards & Weak Signals (WI-WE) shaping and shaking the future of science, technology and innovation (STI) in Europe' in Manchester, United Kingdom. This was part of the preparatory work for a series of national workshops aimed to explore the impact of unexpected events on European research and development (R&D) and to look at the implications this may have on future R&D priorities as well as innovation, growth, well being and sustainability.

The workshop methodology was designed by the University of Manchester with the help of RTC North, who invited 19 experts from 7 countries, including: Czech Republic, Finland, Germany, Israel, Russia, Switzerland and the UK. The activities of the day involved discussing pre-generated WI-WE (printed cards), describing new WI-WE and looking at how these may interconnect to give signals and signs for European Grand Challenges. One of the hoped for outputs of the day was to create a 'mock' FP7 collaborative project based on R&D priority areas to address potential 'Wild Challenges'.

The workshop focused on two sectors – environmental technologies and nanotechnology. Participants, from iKnow partners and invited technology specialists, split into sector groups to undertake the activities.

The Environmental Technologies Group

The 'Enviro Group' selected a number of pre-generated WI-WE cards at random and these were discussed, validated and challenged. The WI-WE had been generated using previous Framework projects for inspiration. The WI-WE cards selected came from either an environmental sector pile or an 'other' FP7 themes pile. Some of these included:

- Methods to assess EU vulnerability to natural hazards revealing how it will cope and mitigate impact.
- An earthquake in Rome shocked the world when much of the city (including the Vatican) was devastated.
- Soil degradation becomes a serious problem driven by human activity – but research on genetically modified microorganisms that can restore soil fertility was not implemented due to unknown risks (such as genetic mutation).

The discussion was interesting as participants started to interconnect WIs and WEs and this resulted in the definitions of WI-WE being challenged. It was concluded that the quality and relevance of the WI-WE used is critical. The group considered the notion of 'Wild Challenges' by linking together a series of WI. An example of a Wild Challenge was described as an earthquake leading to a geo-political crisis through a series of 'impact multipliers'. It was also noted that a visualisation approach could be adopted to show the potential inter-connections of different knowledge areas to help envisage a research agenda as cutting across several areas of a 'Wild Challenge'.

The Nanotechnology Group

The 'Nano Group' followed the same set of rules as the Enviro Group in selecting WI-WE. Following the discussions on the selected WI-WE, the group was able to look at interconnecting these to a potential 'Wild Challenge'. There were four nano WI which grew out of the Information Communication and Technologies (ICT) theme that were able to be interconnected. These are:

- Lack of regulation results in major accident – public concern about nanotechnology is high and technology developments are slow and cautious
- Absence of comprehensive nanotechnology integration, adoption and readiness leads to a drastic reduction in post-industrial growth
- Economy playing catch up to nanotechnology – only partial integration into the economy due to lack of readiness and inadequate strategic planning
- Brain to brain communication becomes practicable for widespread use following developments in cognitive and neuroscience

Although it was agreed that these were not necessarily 'wild', there was definite interconnections of WI-WE. The group utilised these WI to look at potential scenarios, such as a failure in nanotechnology leading to a change in the mindset of society. Nanotechnology no longer could be deemed fashionable and human brain-body enhancement becomes a new key priority for R&D If this was to occur, then all people may want to be 'enhanced', but not all may be able to afford this. Potentially, this could lead to a dramatic split in society, with unknown consequences. This led to the Wild Challenge being described as *"Brain to brain technology becomes affordable to all people"*.

This Wild Challenge was corroborated when a number of WE selected were connected to this challenge. For example the development of synthetic telepathy, widespread concerns about possible dangers of nanotechnology and nanotechnology being developed to prevent internal cell actions and replace dying cells. Finally, the group created a mock FP7 project entitled *"Understanding the long term social implications of brain to brain communications"*. The objectives of such a project would be to avoid a divide in society, develop social implications of this technology and make further recommendations for future priority of R&D in Europe.

The full report of the pilot workshop, including feedbacks and lessons learned, will be available on the iKnow website www.iknowfutures.eu from October 2009. ■

About iKNOW

iKNOW is funded by the EC Directorate General Research under the Seventh Framework Programme theme eight: Social Sciences and Humanities (SSH). It is part of a series of foresight initiatives promoting 'blue sky' research on emerging issues affecting European science and technology.

The **iKNOW** project aims to connect knowledge for the early identification of issues, developments and events (e.g. wild cards and weak signals) shaping and shaking the future of science technology and innovation in the European Research Area (ERA). In particular, **iKNOW** will develop conceptual and methodological frameworks to identify, classify, cluster and analyse wild cards and weak signals and assess their implications for, and potential impacts on, ERA. ■

Wild Cards and Weak Signals

Concepts at the Edge of Foresight Methodology, Phenomena at the Fringe of Public and Experts' Awareness

By Cornelia Darheim, Z_punkt, Germany

However expert we become, however sound our judgement about the future, seems – we can be mistaken more often and easily than we'd like to admit. The financial crisis has made this obvious, and has also changed the attention that different methodological approaches in foresight receive. While before, scenarios and trend analysis were the main focus, now wild cards and weak signals as concepts and phenomena as well as approaches are regarded as more important in the face of turbulent times.

Wild Cards and Weak Signals are concerned with phenomena "on the fringe" of awareness and attention of the public, experts and the foresight community. The iKnow team has prepared an overview of literature on these phenomena and approaches in foresight and beyond. Both concepts are, conceptually as well as methodologically, somewhat avant garde and as such exist in the realm of the more experimental, less determinable. However, the review of literature on Wild Cards and Weak Signals has revealed some common factors in defining and approaching WI-WE. Most authors understand Wild Cards as characterized by low perceived probability of occurrence accompanied by potential strong impacts.

Weak Signals have received more attention since the publication of Elina Hiltunen's thesis on the topic, but they also seem to be an approach that has considerable overlap with corporate early warning systems. They are mostly defined as "vague" and sketchy kinds of information or impressions that hint at a possible change in the environment. One goal of the iKnow project is to provide an overview of the definitions and methodological approaches concerning WI-WE. ■

Selected list of sources on WI-WE:

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