

Research Strategies

The next Framework Programme

In October 2016, the Science|Business Network of universities, companies and innovation organisations gathered in Brussels to debate the future of EU R&D programmes. The result: A profusion of ideas, recommendations and warnings for the future of EU research and innovation.



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Planning ahead: What should the next EU Framework Programme look like?

EU planners, it seems, never sleep. Although their current research programme, Horizon 2020, has plenty of money left to spend – some €30 billion between now and 2020 – the groundwork for the 2021- 2027 edition, provisionally called Framework Programme 9 (FP9), is already being laid.

It will likely be the subject of an epic battle. A surge of populist politics across the bloc and a funding hole left by the departing UK could force the EU into spendthrift mode, leading to even more competition between the many research fields seeking attention.

Should military and cleantech R&D get higher priority than before? (The start of FP9 may coincide with the second half of a Donald Trump presidency, after all). What's more important: Getting more breakthroughs from top (and usually rich) universities or developing more research and engineering talent in poorer regions? What about fighting the creeping danger of antimicrobial resistance, or other global health problems? And where will the cutting edge tech of the future – such as gene-editing, big data and artificial intelligence – fit in the agenda?

These were just some of the issues being discussed now by members of the Science|Business Network, uniting more than 50 universities, companies and innovation organisations across the EU. The kick-off for these ongoing reflections was at a Science|Business conference, 'Research Strategies: Europe 2030 and the next Framework Programme', on 12 October 2016. At that conference, a series of foresight experts for the Commission presented their vision – utopia or dystopia – of the challenges for research and innovation for the decades ahead. And in a series of workshops, attendees debated these scenarios and the best possible policy responses. The 250 participants were, in themselves, experts from every possible field and sector across Europe. At the plenary sessions, they were joined by more than 2,000 online viewers.

This report distills that day's work into a set of suggestions for the next Framework Programme. They do not represent official policy in any way: They are simply a summary of frequently heard ideas from participants at the conference. A more formal, considered view of the Science|Business Network will come during 2017. But for now, these suggestions are offered as a kind of instant public consultation at this very early stage of Framework planning.

Framework Programme 9: Possible directions

Defence and security

- Expand funding for security research with dual civilian/military applications (e.g. drones and cyber-defence)
- Designate as a major theme for FP9 'Making Europe safer'
- Include direct military R&D in Horizon 2020 – or at least coordinate it closely with EDA or other EU military activities
- Focus on early-stage security research, between Technology Readiness Levels 1 and 3
- Fund social science-led investigations into the causes of insecurity and disenfranchisement
- Fund social innovations to prevent conflict
- Create flexible projects for disaster preparedness (e.g. pandemics)
- Fund research into making key infrastructure resilient (e.g. grids, satellites)

Digital healthcare

- Step up social sciences and humanities research to tackle legal, ethical and social implications of the digitisation of healthcare
- Fund research that could create disruptive new models for how patients pay for their healthcare
- Promote standardisation and quality control of health data
- Develop programmes to involve patient input
- Create more, broader, multi-stakeholder projects that help integrate health, ICT, devices, carers and all the other sectors involved in healthcare
- Focus more effort on disease prevention, rather than cure or treatment
- Develop acceptable ways to manage privacy and security of patient data
- Explore new ways of paying for healthcare, for instance integrating medicines and equipment

Energy

- Further enlarge funding for solar energy projects
- Consider creating a multinational solar energy research centre
- Develop better energy systems planning (e.g. balance of generation, storage, consumption)
- Promote social research on energy consumption patterns
- Investigate new 'green' taxation models to steer consumption in the right direction

Connected cars

- Plan research into 'system of systems security' – that is, security for the network that would control driverless cars and automated transport systems
- Promote data standardisation and privacy for driverless cars
- Support (re-) training for engineers in this emerging field
- Encourage more citizens to co-design research objectives in this field, as a way to promote inclusiveness

Cross-sectoral themes

- Don't scatter the money too broadly; pick shots carefully – in both topics and regions.
- Experiment more with challenge-based public procurement
- Expand use of innovation vouchers so small companies can be funded to collaborate with others
- Engage research infrastructure in open innovation – to get more economic benefit from labs
- Investigate open innovation in urban planning

- Develop open innovation projects that involve citizens – for instance, in social innovation for the elderly and infirm
- Create new funding schemes to bet on individuals, not projects – for instance, a ‘young genius fund’

Bridging the gaps within, and without, Europe

- Think broadly about the definition of ‘Europe’– e.g., the European Medicines Agency could cover all of Europe rather than EU only
- Increase international participation with associate and other, looser forms of collaboration (e.g. pursue a model like EU-US cooperation)
- Involve non-members in the FP9 planning process (e.g., Korea, RSA, US and Switzerland)
- Work with research foundations to help bridge the gaps within Europe – though their resources are limited
- Review the impact of Joint Technology Initiatives and public-private partnerships, but these may become even more important to integrate different parts of Europe

On the last category, the spectre of Brexit is omnipresent – and emotions run high. At the conference, when asked for a show of hands, the vast majority of non-British delegates voted to exclude the UK from the next Framework Programme unless it allows free movement of people. But equally, there were some passionate defences offered of the need to include the UK, given its position as the top science power in Europe.

For FP9, the next official steps include a report by a High Level Group of experts led by former World Trade Organisation chief Pascal Lamy by 30 June 2017, followed in early 2018 by the first formal Commission proposals. The actual legislation for FP9 will not be completed until 2020. But no matter: several lobbying organisations in Brussels have already started laying out their own wish lists. They know that, in Brussels, its best to speak up early and often. There was greater support for accommodating Switzerland – though the political temperature is, at present, lower than for Britain.

For many, the prize is money. Universities, research labs, small companies and many others have come to rely on the EU Framework Programmes. The current one, Horizon 2020, scatters more than €10 billion a year across the European research and innovation landscape. The European Parliament is pushing for an increase – though a decline seems more likely. Horizon 2020 fans will try to raid other parts of the EU budget, especially Structural Funds; and they will have to fend off reciprocal raids from others. Budgetary creativity will flourish: Juncker Plan private-public projects, joint programming with member-states, synergies with charitable foundations, and North-South/ East-West “twinning” attempts will all multiply. After, it has always been more fun in Brussels to talk about spending other people’s money – and the current political splintering of Europe makes that approach more appealing than ever.

Why pay any attention to this coming talk-fest? Because planning a Framework Programme is an important policy exercise by which several thousand government, academic and corporate leaders across the EU come to some kind of consensus about what matters most. It’s a setting of priorities, and the sketching of a vision: What can research and innovation, on a European scale, contribute to our lives?



Robert Jan-Smits,
Director-General
for Research
and Innovation
at the European
Commission

How the Commission is preparing for FP9

The preparatory work for FP9 is already underway, with a foresight study, plans to develop new models of how R&D contributes to the economy, and a public consultation in the works.

Speaking at the Science|Business conference, Robert Jan-Smits, Director-General for Research and Innovation at the European Commission, outlined the process, procedure and timetable of the successor to Horizon 2020.

- **Foresight.** The Commission has launched a long-term scenario planning exercise called the Bohemia Study, to be completed by the middle of 2017. “We have asked a group of experts to do a stock-take of the different foresight studies by the likes of the OECD and the World Bank,” said Smits. The aim: To begin FP9 planning with a clear idea of what problems it may need to be solving in the 2020s. This is intended to be an improvement over past Framework exercises – an attempt by the Commission to add an element of scientific evidence to its own policy process.

Matthias Weber of the Austrian Institute of Technology, chair of the foresight study group, said FP9 should “come up with plans to address the challenges of the 2030s.” The group has developed two scenarios. The more ambitious sees Europe and its research and innovation investment as one of the key global drivers of change in climate and energy policy, urbanisation, digital healthcare and disease prevention, and security and resilience. The other scenario, with a more pessimistic tone, foresees the “perseverance” of current trends – mostly unpleasant.

- **Economics.** Another strand to the FP9 preparations, Smits said that he is tapping top economists to help make a stronger case for the ways in which research and innovation contribute to the competitiveness of member-state economies. “We’re trying to crack open economic models to get research and innovation in there,” Smits said. Evidence for the success of research could give his team an extra edge in budget negotiations. “Future allocations will be based on the bang for the buck we’ve gotten out of Horizon 2020,” he said. The current programme still has €30 billion left to distribute and in current budget reviews is likely to gain back €400 million out of €2.2 billion previously cut from the programme.
- **High Level Group.** The Commission has established a panel of 12 experts, chaired by the former director-general of the World Trade Organisation and EU trade chief, Pascal Lamy. The group will base its advice on Horizon 2020 interim evaluation results and other evidence drawn from the public consultation. It will wrap up its work by 30 June 2017.
- **A public consultation** has opened, with researchers and industry invited to share their experience of Horizon 2020.

FP9 priorities

The Commission is expected to release its proposal for FP9 early in 2018. It will then take between 18 and 24 months to clear it with the European Parliament and the EU governments.

Smits gave some early thoughts on the predominant themes of the new programme.

One is defence. Germany's minister for education and research, Johanna Wanka, has raised this priority with the Commission, Smits said. Currently, EU law bans pure defence research under Framework Programmes, but grants are available for so-called dual-use technology, research into crime prevention, security, and disaster preparedness. Already, the Commission approved a tripling of military R&D, to €90 million through 2020, in a separate organisation, the European Defence Agency.

Other FP9 issues being considered include: more money to build R&D capacities in Central and Eastern European countries; whether the Commission should continue to co-fund R&D by big companies; and ways to increase international participation. The Commission had intended Horizon 2020 to facilitate more international partnership, but has been disappointed so far with the results.

One thing that may not change radically is the basic structure of the next programme. Horizon 2020 rests on three pillars: excellent science, industrial leadership and grand societal challenges. Smits said he believes the basic structure and methods of Horizon 2020 appear to be generally approved by many stakeholders – so there is not high pressure for radical change in FP9.

Smits also provided a brief update on the European Innovation Council, a proposal by his boss, EU Research Commissioner Carlos Moedas, to be part of FP9. It will include new funding schemes, based on an existing Horizon 2020 programme called the SME Instrument, to help innovative small companies develop and test new products and services. It will also aim to make it easier for innovators to connect with the Commission and its programmes. Smits said the need for the new council is borne out of the feeling that grants are not always available for risky projects. "We don't give sufficient support to the crazy ideas," said Smits.

Money wrangling

Christian Ehler, a prominent German member of the European Parliament who will be the 'rapporteur' for the FP9 legislation, said the Parliament will propose €100 billion for the programme over seven years – an increase from €77 billion for Horizon 2020.

Whether the Commission can raise this much money is another question, especially when the practical headache over the UK's role in FP9 is taken into account. For now, Commission officials do not know if the country will have some form of associate membership like that held by Switzerland, and contribute to the budget for 2021-2028.

In the face of the uncertainty around the UK's position, Ehler raised the prospect that extra money can be found with some creative arm-twisting. "Politically it's not out of reach. Member states have to admit they have failed on 3 per cent research spending," he said. This was a target agreed by EU members in 2002, but since then ignored by all but a few rich countries.

"Our conviction is that the structural and agriculture funding, the two biggest parts of the EU's budget, are not going to change Europe. The conviction of politicians to keep paying into [these programmes] is not as strong anymore. Europe is getting more realistic," Ehler said.

And international competition dictates that the Commission will need to come up with a large budget for FP9, said Lino Guzzella, president of the Swiss Federal Institute of Technology in Zurich. "Singapore has just revised its research budget upwards by 20 per cent," Guzzella noted.

Guzzella said he wants to see Horizon 2020's commitment to excellence carried forward in FP9. "I would not want to see a disruptive change; that is my appeal," he said.



Matthias Weber,
the Austrian Institute
of Technology

Rosy or gloomy?

Researchers sketch possible directions for Europe

The European Commission is kick-starting the debate on FP9 by looking into the future: It has commissioned a group of futurologists to summarise expert opinion on what might be happening in Europe during and after FP9 – in short, what kind of a world will research need to deliver?

The foresight exercise, called the Bohemia Study, will be completed in the second part of 2017. Matthias Weber of the Austrian Institute of Technology, leader of the study group said FP9 should “come up with plans to address the challenges of the 2030s.”

The group has started to work on two scenarios, which are based on a “broad review” of forward-looking reports and analyses, said Weber. The more ambitious one sees Europe and its research and innovation investment as one of the key global drivers of change in climate and energy policy, urbanisation, digital healthcare and disease prevention, and security and resilience. “We hope to achieve a global realignment around major goals by 2030,” Weber said. The other scenario foresees the “perseverance” of current trends and the intensification of existing challenges.

The rosy scenario

In the upbeat view of 2030, the next Framework Programme could actually help a troubled world. The group envisions a future where coordinated EU policies and the smart implementation of digital services will address grand societal challenges such as security, climate change, and disease prevention.

According to the foresight exercise, by 2030 the EU could focus its research and innovation policy on projects with “high social returns” and create “open ecosystems for research, innovation and education.” Also, Europe could be at the forefront of the transition to a low-carbon economy and a sustainable production-consumption system, the so-called “circular economy”.

Last but not least, according to this optimistic scenario, the EU and its member states will invest more in research and innovation in order to boost private investment. This increase will have a major impact on the creation and the growth of leading companies in key global sectors such as environment, health, smart cities and societal security.

The gloomy scenario

The Bohemia study is also scoping a gloomier view of 2030 – but in fact, it sounds a bit like the situation today. Demographic changes, poor education, and strong migration pressures could boost economic inequality, possibly generating “global turbulences.” In addition, extensive digitalisation of the economy could lead to massive unemployment. Public policies become dated, as governments can no longer keep up the pace with fast technological change.

In such a scenario, research and innovation investment will “not be [able to] deliver on social and economic promises,” with science budgets slashed and Europe’s scientific base eroded.

The future of healthcare

The Commission’s foresight exercise is also looking at how key sectors will evolve by 2030, to identify potential and challenges ahead. “These are just a starting point for knowledgeable and intelligent people to test and challenge them,” said Kerstin Cuhls, scientific project manager at Fraunhofer ISI.

Depending on how Europe chooses to move forward, the healthcare sector could thrive and become more effective and fair, but it could also take a turn for the worse. In the near future, inequalities in access to healthcare could increase and generate broad public discontent. However, the Bohemia study is working on the premise that scientific breakthroughs and new technologies provide the motive power to drive improvements in healthcare in Europe.

In this scenario, gene therapies are available to treat inherited diseases, while new antibiotics address antimicrobial resistance. The digitalisation of healthcare will connect health monitoring devices to patients, and doctors and insurers to electronic health records. This will allow policy makers to switch the focus of healthcare systems from treatment to prevention, increasing life expectancy whilst controlling costs.

These scenarios resonated with some speakers at the conference. As it is now, “digital healthcare is lagging behind,” said James Eshelby, head of European R&D business development at Pfizer. The implementation of digital healthcare systems requires the cooperation of a large number of stakeholders, including but not limited to patients, programmers, telecommunications companies, hospitals, politicians, doctors, and lawyers. “They all have to be taken into account,” said Eshelby.

The Commission has put out calls for research projects that aim to solve these problems in the Innovative Medicines Initiative, but more coordinated efforts are needed. Eshelby suggested that Europe put together large frameworks that allow stakeholders to work together.

Healthcare systems of the future will have to become more integrated with other sectors, while citizens are put “at the centre of the decision making,” said Jane Kaye, Director of the Centre for Law, Health and Emerging Technologies at Oxford University. “We have to think more creatively about how to allow flows of data between patients and the healthcare system,” said Kaye.

The future of mobility

By 2030, there will be more than 40 megacities with populations exceeding ten million. Rapid urbanisation will impair mobility and increase pollution, but the roll-out of connected car technologies will help mitigate this, and resulting environmental and health concerns.

As the traditional transport market is currently unfit to handle such challenges, there needs to be a radical change in the mobility paradigm and current business models, using behavioural change and social innovation as drivers of technological progress.

“In the short-term, a system approach is the way to go. The emphasis should be on the collaborative economy, standardisation, quality, and priority research,” said Andrea Ricci, Vice President of Isinnova.

The Bohemia scenarios prompted extensive discussion. Connected cars will only work in smart cities, and more investment is needed in the development of advanced sensors and high-speed wireless connectivity. “From an artificial intelligence perspective, the car is just another item in the internet of things,” said Asunción Gómez-Pérez, Vice Rector at Universidad Politécnica de Madrid.

Cars will use this infrastructure to 'talk' to their environments and to share data with other cars and traffic control systems. Concerns posed by the use and management of data should also be addressed, and stakeholders should move slowly in order to maintain the trust of users.

Fabrizio Gagliardi, chair of ACM European Policy Committee suggested that different approaches need to be tried. An example of one approach could be lower insurance cost in return for rights to some of the privacy of users.

For Europe, connected cars are a great way to start re-thinking the single market and in particular the digital single market. It is a multi-dimensional problem that needs a regulatory system, involvement of the EU and member states, safety agencies and end users.

The future of energy

Many at the Science|Business conference had a clear view of where we want to go in energy. To mitigate the effects of global warming and to reach the COP21 climate change goals, Europe should get most of its energy from the sun, revamp its energy transport systems and invest more in energy storage technologies.

More investment in solar energy research is needed, said Karin Markides, senior advisor to the president of Chalmers University of Technology. One way to do this would be the creation of a large international research infrastructure focused on developing solar energy technologies, she suggested.

Energy is a complex field "locked in tradition and business controls," said Markides. To change this complex system by 2030, new standards need to be built, and the EU should invest more in research projects that explore other sources of green energy, such as nuclear and wind.

Consumer behaviour will be crucial and research budgets for energy should include social sciences projects. Member states need to devise new 'green' taxation measures and establish communication campaigns to raise the awareness of good energy practices. Increased fiscal measures would "help research," said Dorothee Lahaussais, manager for energy & fuels at Toyota Motor Europe.



How will the next EU research programme shape up without the UK?

Planning for FP9 is complicated by uncertainty over who is in, and who is out, of the programme

The shock UK referendum result in June 2016, and that of February 2014 in Switzerland, raised an increasingly common dilemma in the EU: Voters in both countries want more control over migration in their territory, while keeping access to the single market and other bilateral deals, such as participating in FP9. The EU, however, maintains freedom of movement and access to EU markets and programmes are legally conjoined.

Since then, the Swiss appear to have resolved the problem, with a relatively minor change in how they handle immigrant employment that the European Commission signalled would be acceptable. But the UK uncertainty is greater than ever, and the prospect of both countries leaving Framework would have been devastating, many researchers said.

"If we exclude Britain and Switzerland, it will do big damage to the European research programmes," said Wilhelm Krull, secretary general of Volkswagen Stiftung, a German foundation for the promotion of research and education.

Similarly, Ludwig Neyses, vice president for research with the University of Luxembourg, made a passionate call for UK inclusion in FP9, saying, "It is extremely important to have the UK in European science. We should tell the UK we really need you with all we have," he said.

Sympathy for the UK's position was far from universal, however. A straw poll of the 200-odd audience members suggested the vast majority were against any special deal for the country. Francisco Gagliardi of ACM pointed out that Switzerland, a non-EU member, has made concessions in return for access to EU research. "I'm not asked to show my passport in Switzerland but I am in the UK," he said, implying the UK should now expect to make similar compromises.

Referendum damage

"The uncertainty in Britain is dreadful," said Jeremy Farrar, CEO of the Wellcome Trust, the world's second largest charitable research funding body. "If you're a researcher thinking about where to spend the next part of your career, I can understand why you'd choose Amsterdam, say, and not make the riskier move to the UK."

Switzerland has already felt the repercussions of the February 2014 vote to impose quotas on immigration, potentially ripping up a bilateral deal with the EU on free movement of people.

The EU swiftly retaliated, demoting Switzerland in Horizon 2020 temporarily. The country initially clawed back the right to participate in one part of the programme, Excellent Science (chiefly, the basic science grants offered by the European Research Council), but had to pay the grants of any Swiss researchers involved in Horizon 2020's second and third pillars, industrial leadership and societal challenges. The proposed new deal between the EU and Switzerland, authorised in December 2016, would permit something of a return to normalcy.

"I would like Switzerland to be a full part of all three Horizon 2020 pillars and the next programme," said Barbara Haering, president of advanced studies in public administration at the University of Lausanne and a member of the country's governing body for the federal technology institutes. There has been damage to Swiss research in the past two years. "It's losing its attractiveness for high-end researchers," Haering said.

Critical juncture

Despite recent tough talk from the UK government, "I can confirm there is no vision at this time", said Jacqueline Kay Swinburne, a Conservative member of the European Parliament for Wales, who supported remaining in the EU. "The analysis is still being done," she said. "There is no hard, soft or scrambled Brexit."

Swinburne's view is that the UK will keep its place in EU research programmes. "I personally believe the UK will continue to invest in EU research budgets. I think over time [the government] will find a way to [participate]," she said.

But, perhaps as a slight hedge against a full divorce, Swinburne also pitched Brexit as a catalyst for a rethink, suggesting for example that if the European Medicines Agency was re-cast as an intergovernmental body like CERN it could remain in London. "It's politics – everything is up for grabs," she said.

Jeremy Farrar of the Wellcome Trust said there is a great responsibility on politicians to get things right in the UK. "We are in a really critical juncture because the choices we make will have implications for 50 years," he said.

There is a similar feeling in Switzerland, where a campaign to overturn the 2014 referendum is underway, with a return to the ballot box possible. "We are trying to resolve the question [and] find a soft interpretation of the February vote," said Haering. "It would not be the first popular referendum where the interpretation was soft."

Engaging with antipathy

The referendum results in the UK and Switzerland showed that a bubbling discontent with Brussels has been fatally ignored for years, the audience heard. "We didn't take votes in national countries seriously. You remember referenda in France, the Netherlands and Ireland that were ignored," said Krull.

In the UK, popular concern about immigration was not treated seriously by politicians or researchers until it was too late, said Farrar. "There are huge benefits to freedom of movement within the EU. But we have to learn something from Brexit and talk beyond our own group," he said.

"As researchers, we've been too inward-looking," Farrar said. There is a need for sociological research to get an understanding of what lies behind one of the key sentiments of the referendum, as voiced by Brexiteer-in-chief Michael Gove, then secretary of state for justice that, "people have had enough of experts."



What themes should FP9 cover?

Defence, energy, health, open innovation – take your pick. Everybody wants their own field included in the new Framework Programme. But how?

1. Defence R&D – in or out?

The fear of living next door to an emboldened Russia, and of the US disengaging from Europe under a Donald Trump presidency, has spurred the EU into drawing up ambitious military research plans worth billions of euros over the next decade.

A new scheme, which will cover the years 2017-2020, at an estimated cost of €50-100 million, would pave the way for a full research programme that could require a budget of at least €3.5 billion between 2021 and 2027.

But the EDA is a separate budget line from the Framework Programmes, and some want a similar defence R&D push under FP9. According to Robert-Jan Smits, director-general for research and innovation, the German government has already raised the issue with EU Research Commissioner Carlos Moedas.

This would mark a big change: Horizon 2020 rules do not permit pure defence R&D, although there is money for such varied ‘civilian’ security projects as crime prevention, cybersecurity, cryptography, border screening and forensics.

Frederic Mauro, a defence analyst who is also a lawyer at the bars of Paris and Brussels, says the choice Europe faces is between continuing “fatal” trends of low spending, with the burden now mostly falling to the UK, France and Germany, or seriously ramping up R&D investment across the bloc.

He raises the possibility of using FP9 money to create a new “ad hoc joint technological initiative”, a public-private cluster of companies and universities, to help manage EU R&D priority setting.

There's also the suggestion that FP9 could invest in infrastructure critical for military training – such as wind tunnels – and non-EU members should not be allowed join any defence projects.

According to Jennifer Cassingena Harper, consultant with the Malta Council for Science and Technology, future research should involve a bigger effort to tackle the “root causes of insecurity”. This would see a greater emphasis on social science research and social projects which engage citizens, over technological fixes.

As a participant in the Commission's Bohemia Study, she said, Europe may face an “escalation of high risk, low probability security events” in the future: “High risk because of how inter-connected we are becoming, meaning vulnerability to a cyber-attack,” she added.

Another area of focus should be autonomous systems such as drones, said Didier Schmitt, member of the space task force with the Commission's External Action Service. “Planes are going pilot-less, cars are going driverless,” he observed.

Some scientists would prefer to see FP9 steering clear of military research altogether, however.

UK-based Scientists for Global Responsibility is calling for a serious debate among scientists before the EU “crosses [this] line”.

“The plan disturbs us greatly,” said Stuart Parkinson, a mathematician and director of the lobby group.

“The EU is a civilian initiative and a holder of the Nobel Peace Prize. Do we really want to cross this line?” Parkinson said.

He's concerned it will boost arms exports to countries with poor human rights records like Saudi Arabia. The money would be better spent on understanding how conflict starts, he believes.

2. Connected health – for a better health system

Big data and its potential to transform health requires attention in FP9, many experts believe.

According to Ludwig Neyses, vice president of research at the University of Luxembourg, it can help us determine how long humans will live and their quality of life as they age.

Acceptability of big data in society is another interesting issue. A better understanding of the ways digital tech empowers patients is needed, said Jane Kaye, director of the Centre for Law, Health and Emerging Technologies at the University of Oxford. She called for better patient polling, which could improve diagnosis, treatment and prevention strategies.

“We need to understand social expectations as to how data can be used for multiple health purposes in ways that are trustworthy, transparent and accountable, are in accordance with the law and the values of a civil society,” she said.

For François Nicolas, formerly vice president for diabetes and cardiovascular integrated care with Sanofi, the big issue to tackle is prevention. “Chronic disease represents a major challenge for the EU,” he said. “It is the leading cause of mortality by far and represents a huge proportion of healthcare budgets – 70 to 80 per cent, or an estimated €700 billion in the EU alone.”

Fighting disease requires a multi-pronged assault from healthcare and social care professionals, as well as a major effort from patients themselves. “New technologies such as wearables, mobile

devices, big data and machine learning can help design the holistic solutions of the future and provide a personal experience,” he said.

For example, new technology could identify people at risk of developing a type 2 diabetes several decades in advance and reduce this risk by adapting their environment or lifestyle. Another example – shorter term – would be to use continuous glucose monitoring coupled with analytics to warn patients of their risk of hypoglycaemic events before they occur. This is already in development, said Nicolas.

3. Energy: Solar, solar and more solar

Most energy should come from the sun rather than oil. That is the principle Europe’s energy model should follow, according to experts.

This revolution will be helped along by a drop in the price of solar energy: in 1990, a consumer would pay around €30 for a Kilowatt (kWh) produced by photovoltaic panels (now the price is 17 cents). This amount is expected to shrink 3 to 6 cents per kWh by 2020, according to studies presented by Gill Ringland, chief executive officer of SAMI Consulting.

She says that the solar revolution could help to keep the rise of Earth’s temperature below 2°C, as set out in the Paris Agreement signed by countries in 2016. Moreover, it could bring other unexpected benefits – such as water desalination plants in isolated parts of North Africa and the Middle East.

An idea for creating a CERN-like research centre for developing solar energy technologies, proposed by Karin Markides, former president and CEO of Chalmers University of Technology, and Ringland, found many supporters in the room. If established, this proposed institution should be international rather than European-only.

Getting away from solar, attendees pointed out that the supply of energy in Europe should remain highly diverse, with nuclear, biogas and wind holding on to their spots. There needs to be continued investment in research for better energy generation but also in projects for enhancing storage, transmission and use of energy.

Consumer behaviour should be addressed in FP9 too. Participants said there was a place for social sciences in the energy budget line, alongside campaigns for raising awareness on good energy practices.

4. Connected cars in cities of the future

By 2030, there will be more than 40 megacities with populations in excess of ten million inhabitants each. It’s not hard to imagine that public infrastructure will be overstretched in these cities, and questions on mobility a matter of some urgency. Without the right attention from researchers, architects and policymakers, the result will be increased congestion, potential urban decay and a situation in which car emissions reach levels well beyond those considered tolerable, participants heard.

The traditional transport market is currently unfit to handle such challenges. Even with a transition to more automated vehicles, there is an overestimation of reliance on technological progress alone in this area. There should also be more emphasis on behavioural changes and social innovation as drivers of technological progress, with an appreciation that such changes take time, said Andrea Ricci, Vice President of Italian research institute Isinnova.

Cars will use new infrastructure to ‘talk’ to their environments and to share data with other cars and traffic control systems. Asunción Gómez-Pérez, vice rector at Universidad Politécnica de Madrid, noted “that from an AI perspective, the car is just another item in the Internet of Things. There are

many stakeholders who will need to deliver the data and it will come from many domains, not just traffic control systems but also schools, restaurants, etc.”

The problem here is that the data will come in many different formats. In order to build a proper data sharing system, formats that allow for the simplest sharing should be developed. Stakeholders should move slowly in order to maintain the trust of customers. In essence, if we want to aggregate data, new sharing models need to be developed.

A more challenging task is ensuring access to data. There is open and closed data and this is why it is important for any transition to take place at an appropriate pace. It will never work if the trust of the customer is lost. Individuals will need to be incentivised to opt into the system.

Francisco Gagliardi of ACM suggested that different approaches need to be tried. An example of one approach could be lower insurance costs in return for rights to some of your privacy.

There are also several security dimensions. Here, standardisation can also play a big role, said Carsten Maple, professor of cyber systems engineering at the University of Warwick. The auto industry already has many examples of standardisation, anti-lock braking systems being just one of them, he pointed out.

5. Open innovation – the uber-trend

Open innovation – gathering diverse partners to co-create new technologies and services – is trendy. The term was coined only in 2003 by a University of California-Berkeley researcher, Henry Chesbrough, but one could say it has been the leitmotif of EU Framework Programmes since their start in the 1980s. But now people want more.

Among the suggestions was to start involving Europe's big labs in open innovation. These research infrastructure have been pioneering science for decades, but in the process have had to develop a wide range of useful technologies that could now be commercialized, with the right partners.

One group, the ATTRACT consortium, has proposed doing just that with a new initiative to develop sensor and imaging technologies from CERN, the European Molecular Biology Laboratory, the European Southern Observatory and other labs. The group, said Sergio Bertolucci, chair of the ATTRACT scientific committee and former research director at CERN, is planning a pilot in Horizon 2020 but aims for an expansion, with cooperation from the European Investment Bank, in FP9. The group projects as many as six million jobs could be created from the technologies – part of the Internet of Things.

Others advocated an expansion of other EU open innovation projects. One of the biggest examples might be Clean Sky, a €4 billion collection of academic and industry partners, which pools research and expertise to develop quieter and cleaner aircraft.

The chair of its governing board, Ric Parker, former director of research and technology with Rolls-Royce Group, says it is working well. “Some of the EU's JTIs are not perfect,” he said. “But given the budget boost we got in 2013, it seems the Commission trusts us” in Clean Sky.

Parker thinks the EU for the most part should continue on the path it is on with open innovation, and sounded a note of caution on pushing for more open science. “Too much open science is actually dangerous for Europe – we can't go giving our new ideas away for free,” he added.

Jan Palmowski, secretary general of the Guild of European Research-Intensive Universities, a new lobby group in Brussels, talked about another open collaborative model.

Assisted living experts at Germany's University of Tübingen create highly designed spaces for pensioners and invite care workers and companies to gather and observe how well they work. It's

not just about trying out new kit, but hearing first-hand experiences of what works well and ways to improve things, he said. “It’s this, the social sciences and humanities aspect, that we need more of in FP9,” he said.

While open innovation is important, Mario Cervantes, senior economist in the OECD’s directorate for science, technology and industry, reminded the Commission to keep seeding the ground for future discoveries. “We should not lose sight of encouraging deep learning,” he said. “The European Research Council (ERC) will continue to be important for this.”

Bertolucci of ATTRACT also expressed support for the EU’s basic research funding. “The ERC was very successful because it was planted in an existing environment,” he said. There’s a lesson for the proposed European Innovation Council here, he added. “Don’t plant it on sand, or it might fail from the beginning.”

As demonstrated by Palmowski’s Tübingen example, it doesn’t just have to be researchers or small companies that benefit from funding, Cervantes added. “Maybe we need some mechanisms to get money to city governments. Knowledge capacity is needed in cities too,” he said.

6. Scale-ups – vouchers, procurement and geniuses

The discussion around promoting scale-ups in FP9 offered up several deceptively simple ideas.

One was networking. “Why not hand out matchmaking vouchers?” suggested Pekka Soini, CEO, of the Finnish Funding Agency for Innovation, Tekes.

Such a scheme works for Tekes, and also Enterprise Ireland, said the manager of the Irish body’s EU R&D liaison office in Brussels, Evelyn Smith. Her idea for FP9 involved ‘innovation partnerships’. In Ireland, “we’ll look at spin-outs that don’t have the right management to scale-up and we run calls to get someone in to help,” she said.

Another recommendation was to adopt more challenge-based procurement models. “It’s a powerful tool if used right,” said Soini. This found agreement with Malcolm Harbour, a former British member of the European Parliament, and now a trustee of the University of Birmingham. “It’s still a barely-adopted way of scaling up businesses. I’m currently working with local governments to get it going in the UK, where we have very rigid procurement standards,” he said.

Saara Hassinen, managing director of Healthtech Finland, challenged the notion that all companies wanted to scale-up – most entrepreneurs in Europe simply don’t want their companies to grow, she said: “Maybe they’re afraid of losing their home or car.” For those that do want to grow, the obvious solution for Hassinen is to have them network with bigger companies – again, matchmaking.

Encouraging the best crazy ideas out of entrepreneurs requires novel funding arrangements said Roger Blears, senior partner with RW Blears, a London law firm. His idea was ‘young genius funding’ where you back the person, not the project.

“You don’t know what you’re buying,” he said. “The genius could use the money to buy shares or come up with new intellectual property. Maybe he or she becomes a captain of industry or a merchant banker.” Under this model, the genius pays back 10 per cent of future earnings over a 15 year period.

Blears also liked the idea of tipping some FP9 money into investment funds, rather than using it all on grants. “Public money is better used to support a first loss guarantee fund,” he said.

Mark Lloyd Davies, EMEA medical devices leader in Johnson & Johnson’s government affairs and policy division, thinks the Commission should not be afraid to make a few tough calls on where its

funding goes. “If you want to scale in the US, you go to Boston or the Bay area. But here in Europe, we have multiple ecosystems,” he said.

“How about we pick two spots in Europe where we want to scale and succeed?” he suggested.

He also suggested the Commission try and spur open innovation, and presented a model that Johnson & Johnson applies. The company utilises unused university spaces and invites other start-ups to come and join in special ‘garage’ workshops. “It is win-win: the university gets rent, we make relationships,” he said.

7. Enabling technologies

Radical, as opposed to incremental, innovation is what FP9 needs to strive for, said Marja Makarow, director, Biocenter Finland and a governing board member of the European Institute of Innovation and Technology.

Radical innovation leads to new markets that no-one had previously imagined. But how do you get there? Follow the example of oil giant BP, she said, where researchers are given a free hand and come under no peer review. “The results were spectacular with many new start-ups created,” she said.

Donatella Sciuto, vice rector of the Politecnico di Milano, challenged the Commission to think more about how technology can be exploited immediately after the end of a project. Cognitive computing was around 40 years ago, she said, but has only become really useful relatively recently in big data analysis. Sciuto is critical of Europe’s history in advancing breakthrough technologies: “We are more tech consumer than tech producer,” she said.

Similarly Chris Dance, research fellow with Xerox Research Centre Europe, called Europe out for its relative weakness in computer sciences. “We have to experiment with new forms and resurrect projects that have only just failed,” he said.

Thomas Reiss, head of emerging technologies with the Fraunhofer Institute for Systems and Innovation Research, said if Europe continues with business as usual, it will lead to decline, with increasing competition from the likes of China.

“The policy should be to remain strong in our strong areas – biotech, nanotech, advanced manufacturing,” he said, calling for more foresight exercises to stay on top of future societal trends.

Making bets wisely was also the approach favoured by Tim Softley, pro-vice chancellor of research and knowledge transfer with the University of Birmingham. “You have to take risks and back some big technologies,” he said. “There’s a list of technologies we should be developing – new materials for bone replacements, sensors for measurements whilst driving, 3D printing, the latest battery technology and autonomous vehicles,” he listed.

The benefits of these investments do not have to be immediately noticeable, he accepted. The laser, he reminded everyone, was around in the 1960s but its application for CDs only appeared 40 years later.

Generally speaking, there’s not enough innovation in Horizon 2020, as far as Jan van den Biesen, vice president of public R&D programmes with Philips Research, is concerned. He noted that it’s companies, not governments or universities, that spend the most money on R&D in Europe - two-thirds of the total. As a result, big business files two-thirds of patent applications, whereas science organisations files 5 per cent, he added. FP9 needs to take note of that, he said.

ERC grantees Miguel Martinez-Gonzalez, Riekelt Houtkooper, and Anna Davies, introduced by Wendy Sadler, Director of Science Made Simple



FP9 should keep funding blue sky research, say ERC grantees

Recipients of grants from the European Research Council (ERC) call for a significant portion of the budget of the next EU research programme to be devoted to blue sky research projects.

Funding basic science allows researchers to experiment and to take unbeaten paths towards solving grand societal challenges, ERC grantees say.

“There should be room for blue sky research in funding schemes,” said Riekelt Houtkooper, a researcher at the University of Amsterdam, who is trying to elucidate the relationship between diet and longevity. Houtkooper currently uses worms to test the impact of diet on ageing and will need continuous financial support to take his project to the next step: human testing. “It is a winding road and [it] has roadblocks, but it is very important to invest in this kind of basic research,” Houtkooper said.

The results of such research are not always immediate and it is difficult to convince private funders to support blue sky research. This is a gap public funding bodies like the ERC should continue to fill when FP9 succeeds the Horizon 2020 research programme in 2021. “[Research] budgets should give scientists the freedom to explore uncharted territories,” said Houtkooper.

ERC grants allow researchers to pursue projects with no clear prospects for immediate impact and which no other funding streams would finance. “The strength of the ERC scheme allows blue sky thinking, to approach things in novel ways without being guaranteed success,” said Anna Davies, a researcher at Trinity College Dublin, who heads the ERC-funded Sharecity project, which is researching the sustainability of urban food systems.

“We are allowed to experiment and that is what we need with [grand societal] challenges,” Davies said. Public funding schemes allow researchers to ask new questions and approach topics in novel ways without having to guarantee the success of their ideas. “Almost all the other funding streams require you to know the results before you start research,” Davies said.

Grants for blue sky research also keep scientists independent, said Miguel Martinez-Gonzalez, a researcher at the University of Navarra in Spain. His research on the health benefits of the Mediterranean diet could have been easily funded by food companies, such as olive oil producers and olive farmers, but he preferred to avoid any conflict of interest and maintain the credibility of his research.

“Olive oil companies would give me money,” Martinez-Gonzalez said, “but it is important to be independent and [here] public funding comes into play.”



Academic members

Aalto University, Finland	Politecnico di Milano, Italy
Aix-Marseille University, France	NTNU, Norway
Chalmers University of Technology, Sweden	Royal Institute of Technology (KTH), Sweden
ESADE Business School, Spain	Trinity College Dublin, Ireland
ETH Zürich, Switzerland	TU Berlin, Germany
INSEAD Business School, France	University of Amsterdam, Netherlands
Karolinska Institutet, Sweden	University of Bologna, Italy
King's College London, UK	University College London, UK
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Medical University of Warsaw, Poland	University of Luxembourg, Luxembourg
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Industry partners

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Biogen	Nickel Institute
Dow	Novartis
Foley & Lardner	Pfizer
GE	Sanofi
Huawei	Toyota
Merck Sharp & Dohme	

Public organisations or projects

ACM Europe	EUREKA
ATTRACT	ERC=Science ²
British Council	Hospital St. Joan de Déu, Barcelona
Barcelona Supercomputing Centre	International Consortium for Health Outcomes
BASTION	Measurement (ICHOM)
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