INNOVATION TRENDS

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MAIN SUBJECT

THE UK INNOVATION SYSTEM

Ultimate Innovations the English-way

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Mr. Smith, being a deputy director of Science and Innovation Analysis, you are, so to say, at the very top of the state innovation system. How long have you been working in BIS?

I'm not a bureaucrat or a civil servant. I came from university. And we have an interchange between universities and government. I've been working here for 3 years but really I'm a university professor and I'll be very happy to go back to the university at Imperial College in London. I'm an economist and I have worked on science and technology for a long time. The first thing that I did when I was an economist is that I worked on Soviet Union, on development of 1920's Soviet planning.

In some way innovations have always been with us. But when did the innovation process intensify and, so to say, become visible?

I think that UK is a very important country in this respect. As you say innovation has been a characteristic of human society for a very long time. Humans have always used tools and equipment, from the Stone Age when we used stone tools and stone equipment. Technology and innovation evolved in a very long run. We made stone tools, we developed technologies in many areas – agriculture, making metals and things like that. These are extraordinary achievements. But things really accelerated in the XIX century as Britain was the first country to create a really intensively capitalist economy. And capitalism is a system which creates technological change – because the competition which characterizes capitalism is not about prices. It's about the quality of a product. So, when capitalist production emerged in Britain which was in the late XIX and the early XX century it brought for the first time a system which was strong in innovation, continuous innovation. It has really been a character of the world ever since. It started in Britain and spread to other countries. British manufacturers were selling machines all over the world by 1850. British skilled workers were going to other parts of the world, including Russia, as early as XIX century. I would say that a real breakthrough in the world economy and in Britain occurred 200 years ago. But what we are now living with is a long term impact of that, as we see more and more radical innovations appearing.

What were the main turns in innovation policy after the WWII?

The Second World War was extremely important for innovation policy because the war was fought in different ways. This was of course an industrial war in which countries had to produce on an industrial scale the weapons and equipment that were needed. And they had to innovate in doing that. Now, the Soviet economy was actually very successful in this, but as we know, at enormous costs. The Soviet Union took the heaviest toll in the war and fought significantly more German armies than anyone else and produced more tanks and guns in this industrial war. And this was a very important thing. In the West it was slightly different because we fought not only in an industrial war but also a scientific war. And that is, I think, the difference between the Western allies and Soviet Union. Britain and the US were much more heavily involved in scientific ways of fighting and development of technologies such as like radar and telecommunications and ultimately the atomic bomb. All that research started in Britain and then shifted to the US. Coming out of the war people realised that, as you know, this scientific effort has been extremely important not only to the military but also it had important implications for other sectors. For example, in Britain we developed penicillin – an antibiotic drug – on a large scale during the war and this became the basis of a huge industry. And of course there were military implications as well. But I would say the real lesson of this was the role of science in the West.

After the WWII did there remain military facilities that were turned into research facilities?

Yes, we never stopped what we began during the war and either turned this into military or civilian application. For example, developing computers. I'll give you an example of one of the things that we did in the West which was unique. The Germans used a coded radio system to communicate with their armies, navy and air force. The British were able to break the codes but in order to do that they had to first develop computers. People began to realise that this was very important. That led to the whole developing process of computing after the WWII. So, I don't think we should make a great distinction between the war and the peace.

The government did support the innovation at those times. What happened later on in the 1970s and 1980s?

Government has never stopped supporting the innovation process. It just changed in its forms. We had government, so to say, more committed to market solutions or to supporting companies.

The government has played a major role in either developing or fostering or regulating new innovations. Many of the innovations our system uses are things which in some way have been supported by the government

Like Margaret Thatcher?

Yes, such as Margret Thatcher, but even Margaret Thatcher never changed the science system, she never changed our scientific effort. She needed it, all governments needed this.

May we say that what we are observing is a shift towards market again?

Yes, but I'm not sure how long this will proceed. One of the things that we are facing in the world is a number of very big technological challenges. We have a problem of a climate change, we have a problem of infectious diseases, problems of aging population, and so on. We are not going to solve these problems unless we innovate more. And agencies that will do that are government agencies.

How important is the role of government compared to that of market forces in the innovation process in the UK?

Well, this is a market economy. It's really driven by major market forces and that affects both consumer demand and demand from companies. But it would be wrong to think that the government is not important. The government has played a major role in either developing or fostering or regulating new innovations. Many of the innovations our system uses are things which in some way have been supported by the government.

What BIS is specifically responsible for?

This department is called Business, Innovation and Skills and what we are responsible for is all legislation relation to business and industry – competition policy, regulation and things like that. We are responsible for all of the higher education system, all of universities and that includes both teaching and research; we are responsible for all skills training, all innovation policy instruments, all of the science system. We have a special area which is known as the science budget that means basically 7 large Research Councils and funding for the university system. In a way we attempt to integrate all of the major elements of the innovation system – education and training, business regulation, investment policy, things like that, innovation policy instruments and the science system. These are the key elements of the innovation system and we are responsible for them. And we try to integrate them and to produce an integration policy across them.

The budget of your department is about 16.7 billion UK pounds. What this money is going to?

The two biggest elements of this are the Science budget and the Education budget. The Education budget is changing quite significantly at the present time. The government is switching funding of the education system away from central government and financing it more through university fees which students pay. I think, probably, the biggest single item in the overall budget is the Science budget. This is funding that goes firstly to our system of Research Councils and secondly to universities. We fund approximately 2.5 billion pounds to the Research Councils, about 2 billion ponds to universities. There is another block of funding which funds infrastructure and capital goods in the science system. This funds a big scientific research effort and a big effort of maintaining laboratories and capital goods, scientific infrastructure and so on.

How does this system of Research Councils work?

We have 7 Research Councils. Two of them are related to social sciences, arts and humanities. The others of scientific Research Councils are organized roughly according to function. There is one in biology and life sciences, one on engineering and physical sciences, one on natural environment and so on.

It works like this: the Research Councils make a proposal for funding to us, to BIS. This is a strategic proposal, outlining their priorities and how much they would like to spend. We then asses these proposals and make funding decisions according to views of ministers. We also talk to many scientific stakeholders, interested parties. We have an extensive discussion inside the ministry and out of that comes allocation of funding to each Research Council. They then invite applications from scientists either for programme in some particular area or specific project areas or more general things which scientists can propose. The proposals made from the science community then evaluated by other scientists. There is an extensive peer review system and out of that comes funding decisions. The Research Councils also fund a number of institutes. We have quite a few Research Institutes just as you do in Russia. We have approximately 140 institutes and they also get direct funding from the Research Councils.

The same happens when you give money to universities?

No, it's a slightly different system. We have an organization called the Higher Education Funding Council. It's independent of government. We give a certain amount of money to the

Higher Education Funding Council. They then have the job of allocation it to universities. They do this on the basis of a quality assessment. They monitor and access the output of the universities and they make funding to universities depending on their judgment of the quality of their work over the past 5 or 6 years. The practical effect of this is that we have about 20 or so top universities who get most of the funding. Most of our funding goes to a relatively small group of elite universities. Outside that we have approximately 150 universities in England and many of them get some level of research funding. But usually funding is very concentrated on the top universities.

Do you give the money for specific programmes they apply for or you just give them a certain amount of money and it's them who decide how to use them?

No, they decide. This is money which is based on judgment of their quality and they can use that money in any way they like. So, if they want to build up a completely new area of work then they can use money for those purposes.

You give money for building infrastructure, right?

Yes, that's the third stream of funding. We have a particular Council which is responsible for this called the Science and Technology Facilities Council. They are responsible for financing infrastructure and equipment.

On top of that we would also have funding which is separately provided and goes to things like CERN which is a practical physics organization in Switzerland. We fund a certain amount of international collaborative projects outside of all this.

You build all these facilities. But who can use them?

They are designed for use by research community. Often they will use research facilities in collaboration with other people including companies. For example, we have a big synchrotron that is used for research into molecules and that would be used not only by academic researchers but also by academic researchers working with business companies. For example, Rolls-Royce which is a very big aircraft engine company, would use that facility both by themselves and with university scientists. Look for example at the materials that they are using in their engines.

Do they pay for using these facilities?

Yes, they pay, that's right. Well, if you are a university researcher and you want to use the synchrotron you have access to it free for a scientific project. For a large company then you'll be paying a fee which might be somewhere in a region of 10 000 pounds per day to use it.

By 2014 your budget will go to 13.7 billion pounds. At the expense of what areas this is going to be?

The science budget in the UK was not cut significantly in the last budget. The government is reducing public expenditure as you say by about 15%. But this doesn't apply so much to science. Science budget has been frozen in cash terms. But we do have a decrease in budget for capital equipment and facilities and so on which is much more substantial. I would say a big area which will give us a problem from now on is capital equipment for science meaning laboratories, scientific instruments, large facilities – that kind of thing. There funding will fall. That's the real area that suffers. The science community is going to have to figure out how to handle that.

You won't be able to build as many facilities as you used to build?

We will be building something. We do have some priority projects which we are still continuing to build. We have, for example, new Centre for Medical Research and Innovation in London which will cost about 750 million pounds. It's quite an expensive operation. We will continue to build that. We are also building some new Technology and Innovation Centres. The first one will be on advanced manufacturing technologies. We do have areas which are growing.

Do you expect the private sector to participate and invest more including in building these facilities?

The private sector is participating in some of them. I've just mentioned the Centre for Medical Research and Innovation. That is collaboration between the government, the Medical Research Council and foundation called Wellcome Trust which is a private sector foundation. There will be some participation from the private sector, from charities and foundations.

You've also mentioned business regulation as one of the areas of your specialization. In case businessmen or researchers feel that some regulations need to be changed how can they affect the policy process?

We have a continuing discussion about regulation. Some of our ministers including our Secretary of State believe that the system is too regulated at the present time and they are in favor of deregulation in a number of areas. There is a kind of a dialog between researchers, companies and government about where we need regulation. I don't think we have major problems there.

Where I think we have difficulties, which many countries have, is how we create regulatory systems, for example, for health and safety regulation, environmental regulation that will actually promote innovation. That's a more difficult thing. But we are not trying to use regulation to inhibit or stop innovation. We are trying to use it to promote innovation. Environmental regulation is often directed towards encouraging people to use innovative products that are more environmentally friendly.

Are there any councils where academics can talk to people in the government?

Yes, we have forums. We have a special agency inside this department, for better regulation and they have a continuing dialogue with companies, researchers and universities, people in the health system for example. That's a discussion that is just continuous and never stops.

It's widely discussed at the moment that, the fees for education are going up. What do you think about it?

The basic idea the government has is that education is really quite expensive. There has been expansion of the access to the education in the UK. We now have a million students in this country which is much more than we ever had before. The government finds it difficult to finance all this. That's one problem. We have to find some other ways to finance the system.

The second consideration is that education provides many benefits to students. We do very detailed studies on what happens to students after they graduate and we look at whether or not they earn more money. So, the argument here is that those students who earn more money than they would have earned without education should pay fees for it.

I should emphasize that in this new system the students don't

actually pay upfront. What happens is that the government pays and then the students repay the government. But they only repay the government if they achieve a certain level of earnings. If you don't achieve a basic level of earnings – then you don't pay. If after 30 years you will not repay the debt then the debt is removed, you don't pay anything. It's not complete system of students paying. They only pay if they have a level of income that justifies them repaying.

Why did the government decide to change the policy for foreign students who won't be able to stay in the UK and work after they graduate?

The students can remain in Britain after they graduate if they are able to get jobs and visas. It's not automatic however. But it's important to distinguish between two categories here. There are students who come from the EU into Britain and students from the outside EU. Anyone who comes from inside of the EU has a right to remain here. They can do that, there is no change. The government has tried to reduce the number of visas from people outside the EU.

I think it's reasonable to say that this is a subject of big debate at the moment also inside the government. Our minister, for example, Vince Cable, is opposed to this policy and he has said so. He wants to see more visas for foreign students in the UK. Essentially what is happening is that the people who are responsible for immigration want to reduce immigration, and people who are responsible for innovation want to increase it. We have this disagreement.

How will it influence the innovation process?

We have historically relied very much on flows of people coming into and out of this country. Last year, I mean if we just look at science, Britain won 4 Nobel Prizes with which we are very pleased. One of those people was Greek and two of them were Russians. We are happy that these people are working here but they all are immigrants into our country. We recognize that the flow of people from outside makes a big difference to the scientific capability of this country. This can have a big impact on innovation as well.

There has been a shift from regional to national approach in innovation policy. More specifically, Regional Development Agencies will be cancelled. What idea is behind this change?

I think that the government felt that the Regional Development Agencies were not effective enough. And so it has abolished Regional Development Agencies and replaced them with two things. One is that some of these funding goes to Technology Strategy Board. There will be a more strategic and centrally directed use of resources. There will also be something called Local Enterprise Partnership which will provide, for example, consulting services and venture capital finance for small firms in regions. The government is really looking for organisational changes that will improve how the system works. In government you'll never find a complete solution to these problems. It's very rare that you are completely happy with it. I think the government in this case just thought that a different organization would work better.

The government assumed that Regional Development Agencies were not that efficient. How did you measure their efficiency?

We collect a wide variety of data. When we provide finances for the Research Councils or the Technology Strategy Board, for example, we look very much at what they do with that money. We try to look at the outputs of that as well. We'll be looking to see how many scientific projects are led successfully in scientific terms, did they lead to scientific publications, and how important are these publications. If we are funding something like the Technology Strategy Board we are looking to see what emerged out of the projects, do they develop new products, new prototypes, new processes of production, have made advances in some area. We tried to develop metrics, measures for those kinds of areas. We also collect a lot of data on R&D, and we also do a big survey of innovation firms in Britain. We survey something like 25 000 to 30 000 firms every two years to see what their innovation output looks like. We do have a range of measures adapted for different purposes that we try to use in making policy.

What is the main difference between these two systems – between Regional Development Agencies and the Centres of Excellence?

The Regional Development Agencies were mainly concentrated on small firms. I think that Centres of Excellence are much broader or will be much broader. We are only just establishing them now. They are meant to provide much bigger critical mass of technological expertise. The Regional Development Agencies were too fragmented in support of different sectors of the economy. Centre of Excellence, Technology and Innovation Centres will be more focused on core technologies with a large number of people working on them, a lot of the expertise.

One of these Centres of Excellence will be for manufacturing, correct? What will be the other seven?

It isn't clear what they will be yet. The first to be established will be the Centre for the Advanced Manufacturing. And that would be looking at issues like the development of use of advanced robotics in manufacturing, the use of new materials. So, that will be a range of areas. It will also look at design processes, design and prototyping using new IT solutions. That will allow a very large amount of firms to participate. There then will be a centre which will focus on life sciences and pharmaceuticals research and the other centres are not yet decided.

My view of these things is that in some areas we've concentrated too much, on areas like informational communication technologies and biotechnologies, life sciences. These are important areas but they make up a relatively small part of our economy. If we look at what the structure of our economy is you would find that it's actually very similar to the structure of the Russian one. That is to say that we have a large food sector, food production and food distribution, we have a large construction sector, large transport, one of the biggest sectors in our economy is health. We have a resources sector, not as big as Russia but we still produce natural resources, and that's big. I think if I was going to say what I would think about, it would be some of these very large sectors of trying to induce more innovation and raise the technological levels of these sectors.