Europe, Universities and the Knowledge Society

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Introduction

We know that substantial reforms are needed to improve European economic growth and maintain social well-being in the knowledge economy. As part of this process, public research and higher education find themselves under considerable scrutiny, and there is general recognition that reform is required here also. In responding to this scrutiny, I believe that the correct approach is that governments will enable universities and other public research organisations to become more independent and self-managed, and that institutions will choose to take this route, develop clear and differentiated views of what they are trying to achieve, and put in place the plans, procedures and governance structures to deliver these outcomes.

I do not feel that the scrutiny or the suggested approach present serious threats to the vitality of the university system or its public service mission. On the contrary, the debate is about how this mission is to be addressed. Given the dramatic increase in provision and demand for university training, and the compressed timescales and increasingly global and networked processes within which new knowledge is translated into valuable results, the fact that this discussion is taking place strikes me as helpful rather than contentious.

Like the rest of us, universities are being asked to do more with less, while also becoming better and faster in all respects. I quote from last year’s report [1] by the Commission’s Forum on University-based Research, on which I served. It seems that tertiary education should remain deep, but also extend to support life-long learning and be based on a more trans-disciplinary approach, while degree courses should be shorter and internationally comparable and aimed to develop skills that are more relevant to subsequent employers and
to embedding a culture and spirit of innovation. Research has to remain at the cutting-edge but also reflect changes in the scale and manner in which new knowledge is created and brought into use. Valorisation of knowledge has become a pressing concern but we are not fully clear what this implies for academic ways of working, or indeed for those industries that wish to use this knowledge. Who should own the knowledge and who shall be able to use it, under what conditions, and so on?

In case you feel that these are purely European questions, I mention that two months ago I took part in a meeting at the National Academy of Sciences in Washington DC. The opening speaker said, “For decades, US Universities, National Labs, and Industrial Labs operated nearly independently, each secure that they represented the best in the world. Now budgets are constrained. The only way to obtain the maximum advantage from all three segments of the US research establishment is to work together.” Another speaker showed this slide:

![Industries & Universities Working Together: It Doesn't Have To Be This Hard](image)

After I spoke, I was approached by the senior Japanese delegate present, who expressed identical concerns from his own country.

For Europe, a main challenge is to develop the effective networked structures that will increase critical mass. For historic reasons, top institutional expertise in all fields has not become concentrated in only a few places in each country. Seeking purely physical concentration of strengths along national lines is also not the right way to go now. Instead, we need to go beyond the capacity of the individual institution and country.

I am sure that everyone recognises these points and conflicting pressures, but you may feel that the main source of problems lies in inadequate funding and overbearing control from governments. You are right, but I suspect that nothing much will happen until university leaders themselves champion the need for change, explain what they propose to do differently, and convince their colleagues and governments that this is the right way to go.
What Does Industry Want from Academia?

So what do industry and business want from academia?

As I am not an academic, I can only speak from the sidelines about university reform. Still, I come from a community that relies increasingly on the quality of our connections with European universities. I find it useful to quote first from a recent paper [2] by the European Research Council concerning the proposed European Institute of Technology: “Overwhelmingly, what is valued most is the training of graduates at the highest level.” The ERC’s view is that this can only be achieved by universities that, over time, have built up strong research groups, attracting top talent and carrying out advanced research in fields of great potential and relevance to industry and business.

These sentiments reflect one point of view. For another point of view, I take the opening words from a booklet by Richard Lambert and Nick Butler on the “Future of European Universities” [3] from the UK’s Centre for European Reform. Lambert will soon become head of the Confederation of British Industry and Butler is a vice president within BP, the oil and energy company. They write: “European universities, taken as a group, are failing to provide the intellectual and creative energy that is required to improve the continent’s poor economic performance. Their efforts in both teaching and research are limited by a serious, and in many cases desperate, lack of resources.” Heady stuff!

I largely agree with the ERC’s sentiments, provided we are careful not to conflate mission and approach. Just because it is necessary to train some people at the highest level, this does not mean that every university must do so. I recognise that advanced teaching depends on scholars, but good scholarship is surely possible without a full range of expensive front-end research in every institute.
The Dutch company, Philips, set out a broader view of relationships, which is shown in this slide. The point is the spectrum of interactions from education through consultancy and industrial professorships to strategic research collaborations.

Many companies and universities experience most difficulty working together in the top right hand of this matrix, institute-to-institute. Because the activities generally have a more strategic importance, the company and university are concerned to ensure good results which include effective intellectual property. (I will not spend time discussing the details of intellectual property management.)

The types of difficulties that tend to arise are illustrated in this next slide. They are minimised when there is a basis of trust and good understanding of different missions and approaches.

To achieve these conditions, each partner must devote time to putting in place the appropriate skills to support these interactions, often across the whole matrix. This investment leads to better collaboration because of greater awareness of fundamental industrial requirements and academic strengths.

Some of you will know that my association is trying to stimulate this process through the “Responsible Partnering” initiative. Responsible Partnering places collaborative research at the heart of the relationship between industry and public research, because of recognition that most of the results generated by public research are hidden “below the surface” and perhaps unsuitable for licence-based approaches.
By making the shared interest in collaborative research and training more explicit, and developing the professional skills to manage these activities and the resulting knowledge transfer more effectively, we hope to stimulate a fundamental change in mindset about relationships between business and academia, consistent with modern approaches to innovation.

**European Ecosystems for Innovation**

110 This takes me on to the question of innovation ecosystems and company growth.

When I talk about the priorities of “industry and business,” I am necessarily representing only those companies that have developed to a stage where they can actually express a view. We cannot hear the view of companies that failed to develop because circumstances were wrong. To the extent that this is a problem for Europe (which it is), one can then ask what part the university system should play in remedying it.

In fact, much of the discussion since the Lisbon Declaration, particularly in connection with the Barcelona “3% target” for R&D investment, has missed this point about company growth. As a result, discussion about desired economic outcomes has turned largely into questioning the R&D carried out by existing companies.

The more important task is to establish the conditions in Europe that produce worthwhile new jobs with high added-value, and produce a sufficient number of people who want to take up these jobs and do them well. Otherwise, we will not be able to afford the social structures we desire, including an effective and world-class public university system. This is the essence of the recent report from Esko Aho’s team, “Creating an Innovative Europe” [4]. Because of global competition, Europe’s larger industrial companies perform broadly as well as their counterparts elsewhere. Larger companies also dominate overall R&D expenditures worldwide, with about 80% of industrial investment coming from 700 companies. However,
much of European R&D investment happens in sectors that perform large amount of R&D at rather low intensities per Euro of sales. Relatively fewer European companies have grown large in the sectors requiring higher intensities per unit of sales.

The gap underlying the Barcelona target reflects this pattern. Look particularly at the last two lines in the next chart. Assuming we believe (as I do) that larger companies will continue to play a dominant role throughout the economy, it is important that global companies will choose to operate in Europe and that new European companies will grow large in the sectors that matter for our own future. Otherwise, arithmetic demonstrates that we can never reach the Barcelona targets.

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<th>Five Sectors = 75% of Global-700 R&amp;D</th>
<th>Global-700 = 80% of Enterprise R&amp;D</th>
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<td>Company distribution:</td>
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<td></td>
<td>Europe</td>
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<td>Global 700</td>
<td>192</td>
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<td>IT hardware</td>
<td>15</td>
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<td>Auto/parts</td>
<td>16</td>
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<td>Pharma/biotech</td>
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<td>Electro/electrical</td>
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<tr>
<td>Software/services</td>
<td>9</td>
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<td>&quot;High R&amp;D&quot;</td>
<td>72</td>
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<td>Other sectors</td>
<td>120</td>
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Open Science, Open Innovation, Open Societies

Perhaps the most important driver of change during the last 15 years has been the openness created by developments in information and communications technologies. This has created problems of adjustment and is fundamentally changing approaches to innovation. This once depended mainly on the controlled qualities of the corporate R&D laboratory, but noticeable changes were evident in the 1990s. These changes were at first stimulated by pressures to reduce cycle time and bring technology development more closely under business unit control. Such pressures have been turned to advantage by those companies that recognise that they cannot – and need not – develop all the required technology in-house.

Within this environment, larger companies increasingly manage innovation-related activities as tightly-knit global operations, while many smaller companies thrive through their ability to test, develop and supply innovative new methods, approaches and products more effectively than larger companies. Everyone works more closely and interactively with others in the private and public sectors. A key competence has become an ability to run these complex, networked operations effectively.
I illustrate this with another slide from Philips, showing how it has opened up its previously closed research centre as the base for the High Tech Campus in Eindhoven. Coombes and Georghiou [5] referred to these changes as a “New Industrial Ecology” and Chesbrough [6] introduced the term “Open Innovation” to describe the shift to combining in-house and external resources.

Organisations succeed by virtue of their ability to gain advantage from the combined activities of competitors, suppliers and customers; to gain economic value also from intellectual property that is not needed for internal business purposes; to treat public research as a strategic resource; to spot and rapidly internalise discoveries from new sources outside the company; and thereby concentrate own efforts on those activities (such as improved service content) that best contribute to value creation and innovation for the company itself.

In other words, they differentiate themselves but work together as part of a network.

An industrial ecology requires an ecosystem. Increasingly, these ecosystems are based around university cities. It is worth comparing the scale of two leading ecosystems and some supporting structures in the USA and in Europe. The American system is larger on every measure, except the number of companies receiving venture capital investment, where twice as many European companies receive on average one tenth of the money. This is very important: practically everywhere we look, Europe is failing to establish the scale of effort to reinforce its strengths in a world of Open Innovation.
So, recognising the importance of larger companies, what do these companies look for in good ecosystems? Two recent studies examined factors driving decisions about the global R&D investments of US- and EU-based companies [7, 8] and reached broadly similar conclusions. The most important features are the potential for market growth, the availability of environments that foster the development of a high-quality work force, and the opportunities for productive collaboration between corporations and universities.

Dealing with the main bottlenecks

This is directly relevant to our discussion about reform of the university system. What shall be universities’ contribution to market growth, high-quality work forces and productive collaboration? The second and third seem obvious, and I would argue that universities also play a role in shaping new market growth. This comes from better connecting scholarship with the expectations and culture of the local community.
So I would argue that universities, just as companies, have an active role to play in fostering the right ecosystems for innovation and should take the steps needed to connect Open Thinking with Open Innovation.

As example of a situation where this connection failed, I look to the way in which we mishandled plant biotechnology and genetic modification ten years ago, and lost the benefit of substantial scientific leadership as a result. Although the proximate cause was Monsanto’s approach to the European market, we might have done much better by anticipating the implications of gene technology and different business models for farmers working within the Common Agricultural Policy.

Consequently, I think that we need a university system that is well integrated with public interests and expectations, sees itself as a partner in the direction and outcome of economic development, and actively develops the connections and infrastructures necessary to be such an informed and active partner.

As further examples, if we say that we need more scientists and engineers, do we know what this means? Do we understand how research-based careers will develop in future and what skills people who leave academic research use and need later in life? If we seek more entrepreneurialism, how can universities help students learn what this involves? Perhaps this is a good reason why some universities should be directly engaged in creating spin-out companies. At least, it seems desirable to promote a philosophy of working closely with innovative SME companies and ensuring that the local science park is effective and well run.

Clearly, no university can cover all bases, so I see no alternative other than differentiation. This does not seem to me to be about the rather straightforward distinction between top-end research-based universities and the rest. I think that the lessons of open, networked innovation can guide us: embedding ourselves in environments where we are obliged to work with others in order to meet our common objectives.

Risks and benefits of differentiation

The potential benefits of differentiation seem quite clear. Institutes become able to define their own priorities; attract, motive and reward the staff who wish to address these priorities; and be recognised for the success that they achieve. Risks are that they fail because their approach is based on false premises or badly implemented. For example, too many institutes may try to occupy the same niche and so none of them gain enough critical mass. But there is a clear distinction between failure of individual institutes, which is a necessary part of competition-based models, and failure of the approach as a whole. The “slippery slope”
argument, that the public service mission of universities will be harmed by acting according to economic self-interest, is, I think, misplaced.

Once organisations choose to differentiate themselves, they must set out what companies would term a compelling “business model.” I do not mean that they are trying to compete as businesses with companies or that the fundamental mission changes to involve operating on commercial terms. The purpose of the business model is to ensure that the institute has a fighting chance of achieving the chosen strategy. From speaking to people in British universities that are well down this road, the difficulty of this task should not be underestimated.

As example, a university that chooses to attract the best postgraduate applicants worldwide must understand that its desired applicants have grown up in the world of Amazon.com and eBay. They expect a web-based application system and an informative reply within twenty four hours. Six weeks’ delay to deal with internal committee processes is not acceptable. It is very challenging to establish the cultural attitudes and procedures that make such processes work well.

Similarly, institutes that wish to work closely with industry must understand what industry requires, and be able to address these expectations. (The same applies in reverse for industry.) They may choose to do so by concentrating on spin outs and science parks, strategic research collaboration with big industry, or in some other way.

Looking beyond supporting front and back office procedures, the business model must also explain where the money will come from. An institute that wishes to be among the top league of research universities worldwide needs a different approach than the (equally-important) institute that strives to support the established local community of small and medium sized enterprises by educating its workforce and providing technical support. But both need free budget with which to purchase advanced equipment or carry out exploratory work beyond the boundaries of grants from public agencies or develop new courses and internee systems.

Lambert and Butler [4] point out the vastly different per capita funding of European and American higher education institutions. This reflects the fact that American institutions draw on sources of income other than public funding. There is no realistic likelihood that European governments will cover this gap from taxation, so there are only three serious options in the near term: a substantial income from tuition fees, a steady stream of successful spin out companies or an extensive programme of collaborative research with industry, with
the funds channelled into new research. I realise the political sensitivities, but cannot see how to avoid dealing with them.

National and International Networks and the proposed European Institute of Technology

So an important point about differentiation in a time of open innovation is that it is always accompanied by networking. Networks are necessary to achieve greater strength than the individual players can provide by themselves.

Such networks can ‘self-form’ but they may benefit from an external push. As part of the Lisbon process, Mr Barosso has decided to provide such a push with his proposal to establish a European Institute of Technology.

His proposal started out by striking the expected wrong chords, including a belief that he was looking for a ‘grand project’, a perhaps in Strasbourg, like Mitterand’s pyramid at the Louvre or Chirac’s new museum of Primitive Arts.

For industry, the background analysis is not controversial: fragmentation, low focus on the translation of knowledge into its industrial context, and a missing culture and tradition of effective public/private partnership are among the main weaknesses of the European R&D landscape. The substantive questions are whether this EIT initiative can make a significant contribution to resolving such weaknesses; whether it is a correct priority at this time; and whether there are realistic expectations for how the model will function.

The European Commission shares the common tendency to launch too many initiatives to address what is basically correct analysis and valid objectives. The system cannot cope with all these initiatives, so what seems a good idea at the start turns out to be poorly implemented.

So much work has gone into refining the Framework Programme, particularly in respect of the Technology Platforms, in order that these can address crucial questions of competitiveness and innovation, and it is vital that this work leads to the required results. But is EIT a distraction? In recent discussions with the Commission staff who are working to put flesh on the bones of the EIT proposal, I have been impressed by several points.

The first point is their recognition of the need for networked scale and capacity in terms of public research capacity to underpin and support innovation by industry. Already, as we have seen, most national systems in Europe are too small to be competitive. Since this situation is not correcting itself fast enough, steps have to be taken to catalyse more rapid change.
The second point is to ensure that excellence will be the criterion for funding. Of course, it is also correct to help improve weaknesses, but this is the purpose of Europe's structural funds. Figurehead programmes must attract the best proposals on their own merits. This is now being recognised.

As was the case with the European Research Council (which incidentally I consider to be an excellent initiative), an EIT will have to be accountable but needs independence from political sway once overall objectives have been set. The plan is that a Governing Council will be selected by a transparent identification process, on criteria of excellence and standing in science, innovation and business experience. Unlike the ERC, this Council’s job will involve some degree of permanency, as it has to establish an overall strategy with key long-term technological challenges and interdisciplinary areas of operation and then it has to implement this strategy.

The Council must presumably count on a substantial new stream of public funding, as we understand that funds will not be taken from the Framework Programme in its current form. However, it will not be limited to these public funds, and indeed the Council will be expected to find new sources of income to fund growth.

As we learn more about the Knowledge Communities that are to be the operational heart of an EIT, we find out that they are to be formed “bottom up” from existing teams that wish to come together as partnerships to propose and execute what, in my language, will be the solid business plans that respond to the “top down” strategic areas defined by the Governing Council. They are expected to demonstrate sufficient critical mass to deal competitively with medium to long term, 10-15 year agendas, covering postgraduate education, research, and innovation, including management of intellectual property, with mechanisms for the Council to review progress and change direction or approach if necessary.

Staffing will be flexible: the Commission has understood that a single model of seconded employment might worsen fragmentation and discourage participation, at least at institutional level. Physical concentration of efforts will therefore be a consequence of success, not a starting point.

Suppose some of Europe’s leading technical universities like Helsinki, Munich, Zurich and Imperial, and public research organisations like TNO, Fraunhöfer and VTT, were to come together and propose such a scheme to increase Europe’s capacity to deal with its key long-term technological priorities. Their proposal might mention the connection to other initiatives like Technology Platforms, set out clear mechanisms for new partners to join, and
agree a collective responsibility for the outcome. It seems to me that everyone would be delighted.

This means that the main fears are that the EIT initiative is too top-down, will dilute other activities, and that the Commission will be unable to overcome legal, cultural and nationalistic attitudes and complications that prevent us from developing this scale and capacity.

So this must be our challenge. As a stimulus for stronger networks of industrially-minded institutes, the proposal for an EIT can be a catalyst for change provided it is built in ways that are consistent with the tendencies of Open Innovation, that the leading institutes want to make it work, and that they are allowed by governments to devise and implement effective business plans. Otherwise it is a distraction and we need to think again. But that will be an unfortunate admission.

The industrial community does contribute to large scale collaborative R&D programmes. There are substantial examples at national level, such as the Dutch Genomics Initiative. Current discussions about European Technology Platforms and potential Joint Technology Initiatives, for example in the areas of embedded systems (Artemis) and pharmaceuticals (Innovative Medicines Initiative), demonstrate the willingness that exists to extend this approach.

Although there is no tradition for industry to take an active role in creating and maintaining institutional infrastructures, in fact world class institutes like IMEC in Belgium have developed through a combination of steady public funding and an ability to attract the long-term committed sponsorship and participation of competing firms.
The role of European Universities and the goals and objectives of the Lisbon Agenda

We are in a transition between two radically different ways of organising the knowledge triangle, one closed and separate and the other open and connected, as illustrated in this final slide [9]. The question is how quickly we succeed in making this transition.

I have concentrated on two factors that can speed up the process: achieving greater critical mass through approaches based on networks, and creating environments that encourage institutional learning by bringing players closer to one another. I think this is what we mean by the word “mobility” – we seek movement of ideas and experience achieved through better awareness and commitment to shared objectives, rather than physical movement for its own sake. I have used the terms “business plan” and “open innovation” several times in order to emphasise the importance of effective planning and recognition of the need for differentiation, linked to the desire to succeed by working well with others.

In closing, it seems obvious to me that a strong university system, committed to all sides of the knowledge triangle, is vital to the success we shall achieve. I feel that the quality of this commitment will be demonstrated by the growing diversity that is seen to exist in the years ahead. But I would like to ask you to act quickly: the rest of the world is not standing by and waiting.

References


