Models for university co-operation strengthening national knowledge economies

A policy analysis

Final report for the 3TU Governance Board

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1. Introduction to the report

1.1. Universities face the challenge of doing more with less

Universities across Europe and America have been profoundly reformed in recent years, shifting from collegial, disciplinary-led, subsidised institutions to organisations managed and led in competitive and demanding markets. The urgency of the financial crisis has brought home to all public institutions, including universities, the necessity of doing more with less. Yet, there is a longer-term challenge for universities - as knowledge-based institutions in an increasingly knowledge-based society - that their success is increasingly interdependent with national economic success. The new approach to management encourages selfish, independent behaviour by universities precisely at the time that integrated approaches to problem-solving and knowledge creation are necessary for nations to deal with today’s most urgent problems.

1.2. Universities face global competition in teaching and research

Reforms of university leadership and governance have been driven by universities’ attempts to attract new resources, talent, staff and partners from an increasingly international marketplace. It is certainly true that leading companies seek out the best universities globally to ensure their corporate knowledge acquisition can deliver a pipeline of highly innovative and competitive products. But this is not just about research: universities are competing for an increasingly mobile international student body, and face the pressures of retaining their best students as Ph.D. students and later faculty, to preserve their internal knowledge bases. But smaller countries with lesser tax bases are simply unable to invest resources with the intensity possible in India or China. This raises the question of how can Europe’s universities compete for these mission-critical resources?

1.3. Universities’ national roles are shaped by outcomes in these global competitions

This is an issue of interest beyond university senior managers, because of the manifold ways in which universities contribute to – and are becoming increasingly important around - knowledge based economic development. Universities create, circulate, store, disseminate, challenge and dispose of ‘knowledge capital’, now acknowledged to be far more important to national economic success than “capitals” such as land, labour or industrial machinery. But universities’ capacities to contribute to national knowledge-based economic development are profoundly influenced by their success in a wider – global – competition for talent, resources, partners and sponsors. This makes universities’ capacity for global competition a question of national interest. Increasingly, for Europe’s smaller member states, the question is how to compete effectively nationally given relative and absolute funding constraints facing higher education.
1.4. **Smart collaboration nationally can help universities compete better globally**

The emphasis internationally is shifting to ‘smart collaboration’ between universities, governments encouraging universities to work with one another to strengthen their overall global performance without leading to complacency or inefficiency (cf. Conn & Bitram, 2002). ‘Smart collaboration’ involves universities working together to improve both their global performance as well as maximising their national economic contribution. ‘Smart collaboration’ creates clearly identified results for universities’ key stakeholders, such as government, students and innovative businesses. But how can ‘smart collaboration’ work in practice, how can its benefits be maximised, and what pitfalls should be anticipated by universities seeking to collaborate to improve both their international competitiveness and their national economic contributions?

1.5. **This report explores how smart collaboration has worked in practice**

To address this question, this report presents findings from a substantial research project considering models, options and benefits for university collaboration. The research project has explored options for university collaboration seeking both internal and external benefits for universities. The research findings are presented more fully in two separately-published project working papers, and which form the basis for the findings presented in this report. The two papers comprised a review of the international literature alongside a set of seven detailed case studies of ‘smart collaboration’ in practice in Europe. The research has been funded by the 3TU Federation, and carried out by the named research team in the Center for Higher Education Policy Studies at the University of Twente in the Netherlands.

This policy paper seeks to understand the consequences of collaborative behaviour on national higher education systems, and how they create wider benefits for key stakeholders. To achieve this, we have structured this paper around three main questions necessary to understand how university collaboration’s potential benefits can be realised in practice:-

- What are the external benefits which collaboration can bring, and how easily can those benefits be achieved?
- What are the options for collaborative activities, and what is best-practice within collaboration?
- Under what circumstances do particular kinds of collaborative approaches function best?
2. University collaboration strengthening national knowledge economies

2.1. Universities are key actors in national knowledge economies

Universities currently face significant pressures to be societally useful, and are increasingly being measured and funded in terms of performance with licensing deals, patents, spin-off companies and other socio-economic impacts. At the same time, universities’ governance and decision-making processes have gone through a quarter century of reform which has made them increasingly sensitive towards performance measures. But these kinds of societal impact measures are funded primarily at the level of the institution, whilst there is a growing recognition – for example as voiced in the OECD Thematic Review of Higher Education, that higher education operates within national systems (OECD, 2008).

In particular, higher education can be seen as a critical element of “national innovation systems” (NISs), formed by connections between universities, governments involves in research, public research laboratories, and businesses which create, diffuse and exploit new knowledge in global production networks, and reinvesting profits in national knowledge infrastructures (cf. OECD, 1997). Universities compete globally to attract talent and investments, business compete globally to create innovative products, and both interact nationally through research collaborations, student flows, partnership agreements, and national science strategies (OECD, 2007). Greater university competitiveness internationally drives improved national economic performance. Figure 1 below shows a simplified version of universities’ involvement in these NISs.

*Figure 1: The role of universities in supporting national performance in knowledge economies*

Source: after Cooke, 2005.
2.2. Universities allow government to influence this wider system

Because NISs influence competitiveness and innovative capacity so strongly, governments take a close interest in maximising their impact. However, governments tend to resist directly intervening in the business sphere, seeking to provide light-touch incentives stimulating business innovation. Conversely, the public research sphere tends to offer few direct opportunities for governments to decisively shape national technological priorities and developments. Governments have therefore been looking increasingly to use university funding to shape their NISs, encouraging provision of useful courses, participation in leading technology institutions, knowledge exchange and transfer between firms, laboratories and universities (OECD, 2007). Government’s key challenge is using funding to create co-operative linkages between universities and other partners in national innovation systems balanced with effective competition spurring innovation.

In Finland, for example, the Government recently commissioned an extensive review of its NIS, which provided overwhelming evidence of the centrality of universities to its NIS. Alongside the Ministry for the Employment and Economy, and TEKES, the Finnish Funding Agency for Technology and Innovation, the universities were the agencies most central to the NIS (see Figure 2). They were seen as being the one semi-independent organisations capable of providing some much-necessary system-wider co-ordination across the NIS (Vughlers et al., 2009). Indeed both small and large companies deemed the universities, as well as TEKES, the most influential supporters of innovation in Finland. In this context, the creation of Aalto, a merger of three leading Finnish HEIs in the field of technology, business and design, can be seen as part of a process creating system-wide co-ordination through reforms to the university sector, encouraging closer collaboration, in this case merger, between HEIs.
2.3. The key national challenge is reducing fragmentation, encouraging spill-over.

What drives national systems’ success can be conceptualised as ‘knowledge spillovers’, where knowledge capital produced in one sector of the innovation system creates benefits that is inexpensively appropriated by other sectors. Because knowledge capital has ‘increasing returns to scale’, improved collaboration by universities helps to develop critical mass in key areas of research and innovation, ultimately raising the competitiveness of the national economy. Likewise, increasing returns means that fragmentation reduces competitiveness, and university collaboration also helps to reduce that fragmentation.

Increasing returns implies that locations that build critical mass are likely to attract further additional resources. Thus, collaboration can contribute by helping to better position the country in the global knowledge economy, attracting knowledge resources and investments, and helping the system function more effectively, with:

- Firms accessing university knowledge and implement their learning in innovations
- Students accessing the best courses and flow into the economy
- Strategic infrastructure is developed and creates/supports critical scientific mass.
3. Ideal-type collaborations: a theoretical perspective¹

3.1. Successful collaborations use linkages inside and outside universities

There can be many different rationales behind why universities collaborate, but common to them is the fact that:-

“Collaboration is the product of a complex web of personal links, strategic drivers, shared history and external pressures. It works best where institutions drive it themselves, based on existing contacts and a recognition of a common external threat or opportunity” (Evaluation Associates, 2002, p. 22)

Collaborations typically comprise various elements to ensure participating HEIs work together effectively, that the collaboration produces desired outcomes, that stakeholders’ needs are fulfilled, and compliance with the HE systems’ wider norms and values. Understanding collaborations therefore requires that these activities should be understood within their wider systemic context. To do this, we distinguish between a number of critical elements within that system, the first four of which are internal (and therefore relatively easily controlled by partners), whilst the latter two are external, and far more dependent on the perceptions and interests of external stakeholder groupings.

- **The collective institution** is the strategic institution holding constituent members together, providing a central decision-making and strategic forum for members.
- **Joint bodies** take place under the collective whole and are consensus-building bodies making decisions on internal issues which affect members differently
- **Shared activities** are projects organised within the framework of joint bodies, often projects, frameworks (for accreditation) or services (e.g. technology transfer).
- **Individual members** are the original units within the collaboration, which have a degree of history as operating viably as independent HEIs.
- **Other universities** are important in terms of the their capacity to enforce and encourage a particular set of behavioural norms, and legitimating the collaboration.
- **External stakeholders** are important, in terms of the support and resources they provide for particular collaborative activities (cf. 2.3).

Connections may exist from the various levels of the collaboration into the outside environment, and therefore the contribution from the collaboration comes by optimising the way those multiple connections function, sensitive to the local context. Each collaborative model presented in the previous chapter therefore has its own internal configuration: these are included in Appendix 1. For each of these elements, regardless of the model of collaboration chosen, there are conditions under which it can best contribute to the functioning of the collaboration, and hence of the national innovation system. We represent this ‘university collaborative system’ diagrammatically in figure 3 below.

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¹ This section draws very heavily on the literature review undertaken in Working Paper 1, published as Benneworth et al., 2009.
3.2. Effective collaborations require leadership and commitment at all levels

3.2.1. A good collective institution is the face to the outside world

Collective institutions contribute by providing a single point of contact with which outside partners can negotiate, allowing governments and business to invest in collaborative activities, certain that their resources are properly accounted for, and working towards desired goals, even where multiple institutions are involved in delivery. Good collective institutions have both capacity to strike agreements on their members’ behalf, and are trusted to deliver collective commitments via their members. For participants, collective institutions allow meeting lead stakeholders’ needs to be met without encouraging external micro-management undermining academic freedom vital for global excellence is founded.

3.2.2. A good joint body resolves tensions within the collaboration

Joint bodies resolve tensions between collaborating members, providing authority and accountability for collective institutions to deal authoritatively with outside bodies. Joint bodies balance the tensions within consortia, and strike a balance between winners and losers in particular strategic decisions. Joint bodies are internal governance devices that ‘glue’ the collaboration together, such as joint academics boards which recognise the legitimacy of both academic departments and research laboratories, internal accreditation mechanisms for research centres, or shared promotions committees. This in turn allow the integration of diverse activity types into the curriculum, community and institutional life. Sometimes, joint bodies will need to overrule individual interests for the common benefit, but ground that in a strong sense of accountability and common interest.
3.2.3. A good shared activity is a building-block of a world-class institution

Given the emphasis on collaborative activity is on building critical mass between complementary institutions, good shared activities are at the heart of the value added of collaborations, by being the activities which attract additional interest, funding, and talent to the universities, and hence to the national innovation systems. Good shared activities are those which are drawn together from across the membership, but have their own logic and internal organisation, and their success starts to become the defining feature of the collaboration. This is underpinned by real collaboration between people previously divided by institutional boundaries, emphasising the dependence of shared activities on strong joint bodies creating structures and policies promoting cross-institutional collaboration (cf. 3.2.2).

3.2.4. Institutions themselves also support collaboration through positive orientation

The most effective collaborations are those where participation is enthusiastic and voluntary, which in turn requires that collaborators appreciate the valued added of the cooperation. This added value comes through attracting additional capacity or additional resources, helps those institutions to compete more strongly - in their wider global networks - for research, students and talent. Participating institutions develop an understanding of the value of the collaboration and its future potential, which improves their contribution to collective institutions and joint bodies (cf. 6.1.2). Importantly, staff at all levels of the institution recognise the support that the collaboration provides for their own activity, whether teaching, research, or engagement.

3.3. External stakeholders can also maximise universities' contributions

3.3.1. Governmented supported collaborations are more likely to succeed

A significant determinant of collaborations' success is governmental willingness to support those activities. Firstly is the willingness of governments to directly fund collaboration, through Excellence Initiatives as we will see in France, Germany and Denmark, or through – as in the UK – a dedicated Mergers and Collaboration Fund. Secondly, as Finnish and UK examples shows, other government departments' willingness to support collaborations can also be important. Government departments are important for funding activities in universities around environment, transport and health, influence the demand that outside parties have for collaborative activities, and critically, universities need reporting systems and evidence to demonstrate their contribution to governmental policy goals.

3.3.2. Effective collaborations benefit universities' most important stakeholders

Finally, external stakeholder support behind university collaborative activities matters. Aalto included a €200m element in the university endowment from business interests and sponsors, whilst KIT has its own foundation which stimulates business engagement. Good external stakeholders are critical friends for universities, supporting and improving collaborations’ public benefits, without excessive regard for the private business benefits. By so doing, societal stakeholders can offset micro-management pressures which governments can inadvertently inflict on universities in return for additional funding, and thereby help to sustain long-term world-class scientific capacity.
4. Approaches for collaboration: from merger to lobbying groups?

4.1. What distinguishes types is the closeness and formality of collaboration

Chapter 3 focused on the four elements of successful collaborative activities in terms of providing capacity to work with external stakeholders. In Working Paper 1, we developed a classification of types of collaboration drawing on the literature concerning different types of collaborative activity. The consensus in an admittedly thin literature was that the most sensible classificatory variable was collaboration closeness (Cf. Harman & Harman, 2002; Lang, 2002; Evaluation Associates, 2002; Curri, 2003; Hyötynen, 2008; HBO-Raad in Goedegebuure, 1992). Various models lie along a spectrum from one-off thematic collaborations, to recurrent and general collaboration enshrined in an institutional merger, illustrated in Figure 4 below.

Figure 3 Models of collaboration classified by institutional proximity and formalisation

| Specific cooperation | Consortia | Federation | Merger |


We have identified six types of collaboration along this spectrum, with each working most effectively in particular institutional, national and economic contexts. Each of these various models can be characterised by a mix of the elements of the university collaborative system (cf. Appendix 1). Four of the approaches (merger, strong collegiate, federation and association) include all four elements, albeit with a different balance between the four. Two of the approaches (thematic consortium, lobby group) are more limited in terms of the number of elements present. Evidence from Working Paper 1 suggested that these latter two approaches tended to be less successful in achieving NIS-wide change, and were better suited to purely internally oriented reforms. The six types of collaborative model are presented below.

4.2. Creating a new strong single institution

Mergers and strong collegiate groupings involve a strong central body that can respond to external stakeholders’ demands in a substantive and strategic way, as well as aligning competencies into critical mass to increase investment successes.
4.2.1. **Mergers: radical steps needing significant support and commitment**

A merger involves two or more independent institutions joining into a single institution which has a unitary governance structure and in which sub-units (e.g. departments) are not duplicated. Mergers are most effective as a means to dramatically increase linkages between a number of partners, when there is a consensus that radical action is necessary, and where there is a need for a single voice to be able to negotiate authoritatively with key institutional stakeholders (usually around access to additional resources). Mergers work best when there are free resources available to promote the merger, where there is a very close fit between the merging institutions, and when there are good reasons for collaboration across the institutions’ main missions – teaching, research and engagement.

4.2.2. **Collegiate groupings: a single body accountable for externally useful outputs**

A strong collegiate system involves a number of nominally independent institutions (e.g. colleges) subordinated to a central collective ‘university’ institution which has power to overrule where strictly necessary for the common good. Its members retain many vestiges of independence, such as appointing staff, but significant numbers of activities are merged, particularly strategic ones. The overarching strength of a strong collegiate system is in providing a single point of contact for key stakeholders and funders, without forcing potentially very divergent institutions into a single “one-size-fits-all” institutional straitjacket. Strong collegiate systems often represent a very delicate ecogology, which thrive best when there is a long history of co-operation between institutions, well-developed conflict-resolution and consensus-building mechanisms are in place, underpinned by sufficient but not excessive complementarity.

4.3. **Creating strong collaborative bodies for partnership & profiling**

Federations and associations are forms of collaboration allowing critical mass to be created and attract external funding for science, technology and innovation, but where value remains in the institutions retaining a degree of autonomy to serve very different stakeholder communities, disciplinary areas or industrial sectors.

4.3.1. **Federation: allowing different kinds of institution to collectively profile themselves**

A federation brings together independent institutions via affiliation to a central decision-making body with independent legal personality, which may have some power to overrule constituent units negotiated between centre and units. Federations are very good at producing quick change, without running up the high costs of a merger, but creating opportunities to build critical mass and shared working habits which can strengthen overall institutional capacity. Federations work best to bring a wide range of institutions together very quickly, and where there is a rational rather than opportunistic rationale: all institutions that can benefit can be involved, rather than merely covering one group.

4.3.2. **Associations: creating critical mass, institutional learning and future capacity**

Associations are independent legal bodies established by a set of HEIs to channel all collective activities between the participants, which proceed through unanimous consensus, and which manage matters delegated to them by the university membership, on those members’ behalf. Associations are most useful when the partners’ consensus is that
they are of external value, either by allowing institution-specific profiling, or by allowing a
group of universities to take the initiative and respond to a government agenda without
necessitating a deeper merger. Associations work best amongst a group of partners that
decide to work together to achieve a particular set of ends, define themselves as a club, and
where there is a strong degree of complementarity between institutions so individual HEIs
are not continually in competition.

4.4. Associations of interest allow focused collaboration on areas of interest

Thematic groupings and lobby organisations are collaborations where universities come
together to collectively achieve private interests without creating a presupposition of the
desirability or the likelihood of further future interaction. They contribute little in terms of
creating public benefits and upgrading national innovation systems.

4.4.1. Thematic groupings: delivering services more efficiently through co-ordination

Thematic consortia are independent legal bodies established to deliver collective services
between participating members, without implying any further commitment to strategic co-
operation. As a result, institutions may be in multiple thematic consortia with the same
partners. Thematic consortia are a way of building visibility and critical mass in particular
areas (such as teaching and research), and in attracting outside funding, without also
requiring that the participants can find a wider common ground at the strategic level.
Consortia work best as a means of best delivering some very tightly defined service, and as
a consequence they work best if membership covers all those who need to be involved in
the delivery of that service. This means consortia membership can develop over time – if
the focus of the consortium changes, then it may make sense either for existing partners to
leave or for new partners to join.

4.4.2. Lobby organisations: creating a common narrative of universities’ contributions

Lobby groups (or think tanks) are independent legal bodies established to represent
members’ collective interests within wider public governance networks. Lobby groups are
most useful where there is a clearly defined challenge to which university partners wish to
collectively mobilise a set of arguments within a particular policy debate, without implying
any real co-operation or interaction between the members outside developing common
arguments. Alternatively, there may be some urgent interest shared by a group of
members, who may otherwise regard each other as competitors for teaching and research
activities. Lobby groups work best when there is a clear external challenge where partners
all want a particular external stakeholder, notably government, to take a particular
decision, but have otherwise relatively limited overlap in interests.
5. Lessons for optimising collaborations’ societal benefits

In Working Paper 1, we considered at length collaborative approaches’ potential benefits through a reflection on the available literature. The evidence base proved to be largely anecdotal and by no means entirely positive. Suspicions were raised that some mergers only succeeded by bringing already successful institutions together without any consideration of the costs of collaboration. Indeed, the literature raised several warnings of practical problems which closer collaboration could bring, from the opportunity costs of disrupting world-class research institutions, through sending confusing signals to partner businesses and laboratories, to the problems of larger class sizes in attempts to increase institutional efficiency. WP1 also highlighted some collaborations which had subsequently failed, alongside a number of more successful efforts.

This emphasises the importance of grounding understanding collaboration’s benefits in a more detailed analysis of particular case studies. In Working Paper 2, we selected seven self-evidently successful university collaborative activities to understand in more detail the nature of those collaborations and how they were made to function successfully. We defined success in terms of four issues of salience to the Dutch NIS:

- Streamlining the national technological domain, optimising the contribution to the NIS of the technical universities & the publically funded research institutions
- Stimulating co-operation for competition, co-operating nationally to better attract external investment in R&D from public/private sources
- Offering a critical mass for research infrastructure to allow funders to invest efficiently and maximise benefits from strategic science infrastructure
- Clustering: creating public benefits and knowledge spill-overs from private investments, stimulating infrastructure access and diffusing technology.

The empirical part of the study consisted of 7 detailed case studies of intense collaborative initiatives. We sought to ensure a range of different types of collaboration (cf. Chapter 4), including mergers, federations and collaborative associations. More details on the case studies including methodology is provided in WP2. The most salient points of the seven examples are presented in Table 1 below, which provides background for the following detailed analysis.

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Table 1 Overview of the seven collaborative activities explored.

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>Main features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aalto University</td>
<td>A merger of three Finnish institutions, Technical School of Helsinki, the School of Arts and Design, and the Helsinki School of Economics, backed by a €700m foundation, to drive human-centred business innovation.</td>
</tr>
<tr>
<td>Danish Technical University</td>
<td>A merger of the Copenhagen-based Technical University of Denmark with five government research institutes spread across Denmark into a single institution as part of Denmark’s world-class university drive.</td>
</tr>
<tr>
<td>Karlsruhe Institute of Technology</td>
<td>A merger between the (technical) University of Karlsruhe and the (nuclear/environmental) research centre Karlsruhe to become a leading German technical university based on globally-acknowledged research strengths.</td>
</tr>
<tr>
<td>ETH Switzerland</td>
<td>A federal arrangement between two technical universities and four research centres in Switzerland creating a single focal point for Swiss technological research.</td>
</tr>
<tr>
<td>Lyon PRES</td>
<td>A federalised consortium of twenty HEIs in the Lyon area, backed by €575m of national and €140m regional funding, to create a world-class university attractive to outside researchers and students.</td>
</tr>
<tr>
<td>Öresund University</td>
<td>A consortium of 11 universities and HE colleges around the Öresund Strait working to better position Öresund as one of Europe’s leading technological regions.</td>
</tr>
<tr>
<td>Universities for the North East</td>
<td>A consortium of five universities promoting collaboration and added value in fields where one institution is unable to work individually, including knowledge exchange, elite athlete and cultural programmes.</td>
</tr>
</tbody>
</table>

The most important lesson from our research is that university collaborations are not a magic bullet solution. Universities’ collaborative activities are embedded within wider systems, notably NISs, and must fit well with those NISs, as well as improve its functioning, reduce fragmentation, increase critical mass and its attractiveness to external investors. Different kinds of collaborations work best in different situations, depending on those external conditions, and the demands and expectations of external stakeholders and funders. Nevertheless, certain actions taken by collaborations can optimise contributions. In the two following chapters, we distinguish between two primary factors, absolutely critical to success (sine non qua), and four secondary factors, which improve overall outcome quality.
6. Primary lessons emerging from analysis

6.1. Collaborating universities need to clearly identify their interest in partnership

The most important success factor is collaborating partners understanding the benefits arising from the collaboration, based on pursuing national and international competition for revenues and talents through collaboration, and agreeing how that will be done. One common method was to pursue a substantial external reward, for instance the German and French excellence initiatives. The Swiss ETH collaboration has a different imperative, functioning as a national agenda-setting mechanism for science and technology policy, though also benefiting from additional resources attached to distributive responsibilities.

6.1.1. The importance of institutional dynamism

One value of a collaborative activity to a university or grouping of universities is in the additional resources that collaboration can bring in. These resources contribute to the core missions of universities – the teaching and research – and help thereby to strengthen that university. There is a need for universities to be clear about the mechanism through which this will function, and to have developed alternative plans for how institutions will move forward if the collaboration does not produce in the short-run the immediate gains hoped for. The more opportunistic mergers, specifically to access direct government funding, tend to produce fewer direct benefits because they are accompanied by less real collaborative activity. Likewise, there were examples where winning significant benefits helped to act as the foundation for much closer co-operation between partners.

- KIT as a merger was founded on a longer-term vision of securing research excellence, and much less on winning German Excellence Initiative Funding.
- ÖU was stimulated during a difficult period in its history by its contribution in winning the ESS, and the additional value of collaboration that this promised.
- The Danish University mergers were proposed by the universities themselves as the best way of merging and at the same time maximising the excellence contribution.

6.1.2. Environment-scanning & future-making

Related to this is it clear that – particularly for the longer-term mergers – the purpose of the collaboration evolved over time in response both to past achievements of the collaborative activity as well as the contemporaneous external demands and drivers. Collaborations have to be continually justified and realised through substantive and relevant collaborative activities – if benefits are to be realised. There is an opportunity for universities to shape the future for themselves by being aware of potential avenues for additional collaboration. But this requires a sense of self-awareness within collaborative activities at a sufficiently senior level to notify partners, and to mobilise a collective response. It is the response rather than the awareness which is critical – in one of the cases, although there was a comprehensive planning for future developments, this was never satisfactorily implemented and led to the decline of the collaborative activity.
Models for university co-operation

• KIT was formed prior to the German Excellence Initiative because two institutions, the University and Research Laboratory were already in close contact.
• ETH was formed as a means to ensure the Swiss technical universities were not disadvantaged by government reforms, by institutions already collaborating effectively
• Both ÖU and UNE developed into means for a group of universities to develop a set of regional priorities which were able to ensure regional development funding helped maximise university’s innovative outcomes.

6.2. Governments’ firm commitment is vital to yield longer-term benefits

A second success factor for collaborations is a long-term and deep-seated governmental commitment to institutional collaboration. In Denmark, the government was committed to the creation of world class universities as well as ensuring the long-term sustainability of its government laboratory sector, and it announced publically and globally a target to create eight institutions via merger. We distinguish four main areas. Firstly, the government creates the environment where collaboration is the best option. Secondly, the government helps by bringing social partners on-board – such as industry or non-governmental organisation, as critical friends. Thirdly, substantial additional resources from the government are a strong signal of long-term commitment, giving the government a direct financial interest in the outcome of the collaborations. In order to hold government interest, there is a need for a big narrative of change, that better collaboration was necessary for better world-class performance, often around league table performance.

6.2.1. Strengthening the overall HEI system by bringing in external resources

One of the main areas where university collaborations can contribute directly to government goals is by bringing additional core science resources into the country by winning public and private R&D investment activities. Universities consortia help to build critical mass around research strengths which other research activities may exploit. By profiling and building complementarities, the studied collaborations all brought in additional research activities which in turn strengthened the NIS, and knowledge economy.
• ÖU helped to create a strong cross-border (DK/SE) partnership which won the €1bn ESS.
• UNE has been active in supporting the regional science strategy, and recently won €30m public support for a corporate research centre in new and renewable energy.

6.2.2. Continually negotiating targets and outputs

In 6.1.2, it was highlighted that pro-activity and flexibility from collaborating universities is important to ensure that the collaboration continually builds the foundations for its future value and justification. But at the same time, Governments need to be kept aware of these developments, and for these developments to satisfy the demands and interests of those funders. In 6.2.3, we highlight that part of this is negotiating formal contracts with governments, changing the targets to meet both emerging HE opportunities as well as the developing policy priorities of particular national institutions. However, there is a need for the existence of channels by which universities and governments can negotiate the longer-term envelope for the development of the collaborations, to ensure that changes made to the policy environment and collaboration serve the best interests of universities, governments and other members of the NIS.
• Lyon appointed as its collective Rector someone with a long history of experience in the national Rectors’ conference and with good links back to the national centre.
• ETH negotiate their performance mandate on a four-year period with the government, with the government acknowledging the ‘special status’ of the ETH domain.

6.2.3. Providing certainty for government in making strategic investments

A third area where collaborations clearly added value was that they provided governments with certainty about where excellence lay when allocating national resources.

• ETH has the most developed mechanism for providing this certainty, with a four year performance mandate negotiated collectively with the central government.
• KIT has agreed a multi-annual budget with the regional and federal state which sets out detailed performance targets in return for its funding.
• In France and Denmark, the new institutions have been monitored by new quality evaluation agencies, which help government follow the progress of their institutions. DTU published a 10 page letter to this agency setting out its progress towards goals (contract funding).

6.2.4. Improving national visibility by improving position in rankings

One of the main claimed benefits for collaborations is to improve universities’ positions in global league tables, and thereby improve the profiling of the national science system, helping to attract additional resources to the country. This is one area where the evidence is more ambiguous, because for the seven institutions studied (and their constituent members), Table 2 shows no systemic contribution from mergers in terms of improvements in global ranking (even taking into account margins of error).

Table 2: Performance of the case study institutions in two league table systems (Times Higher, Jiang Tong), 2003/4 and 2009.

<table>
<thead>
<tr>
<th>Institution</th>
<th>JT03</th>
<th>THE04</th>
<th>JT09</th>
<th>THE08</th>
<th>THE09</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETH Zurich</td>
<td>25</td>
<td>10</td>
<td>23</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Helsinki</td>
<td>74</td>
<td>129</td>
<td>72</td>
<td>91</td>
<td>108</td>
</tr>
<tr>
<td>Lund</td>
<td>93</td>
<td>171</td>
<td>100-151</td>
<td>88</td>
<td>67</td>
</tr>
<tr>
<td>Ecole Polytechnique Fédérale Lausanne</td>
<td>152-200</td>
<td>32</td>
<td>100-151</td>
<td>50</td>
<td>42</td>
</tr>
<tr>
<td>Durham University</td>
<td>152-200</td>
<td>128</td>
<td>152-200</td>
<td>122</td>
<td>103</td>
</tr>
<tr>
<td>Technical University of Denmark</td>
<td>201-250</td>
<td>145</td>
<td>152-200</td>
<td>133</td>
<td>159</td>
</tr>
<tr>
<td>Newcastle University</td>
<td>152-200</td>
<td>179</td>
<td>201-300</td>
<td>162</td>
<td>158</td>
</tr>
<tr>
<td>Karlsruhe University</td>
<td>251-300</td>
<td>152</td>
<td>201-300</td>
<td>207</td>
<td>184</td>
</tr>
<tr>
<td>University of Lyon 1</td>
<td>301-350</td>
<td>-</td>
<td>201-300</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ENS- Lyon</td>
<td>301-350</td>
<td>-</td>
<td>402-500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TU Delft</td>
<td>201-250</td>
<td>78</td>
<td>152-200</td>
<td>78</td>
<td>83</td>
</tr>
<tr>
<td>TU Eindhoven</td>
<td>351-400</td>
<td>83</td>
<td>402-500</td>
<td>128</td>
<td>120</td>
</tr>
<tr>
<td>University Twente</td>
<td>251-300</td>
<td>-</td>
<td>301-400</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

Source: www.arwu.org; www.timeshighereducation.co.uk

A further argument can be developed that mergers have improved of some universities’ visibility, as they have been associated with wider merger processes that are more generally publicised, such as Germany’s Excellence Initiative or France’s Operation Campus.
7. Secondary lessons emerging from analysis

7.1. People are more important than structures in successful collaborations

7.1.1. University leaders should feel a sense of urgency in collaborating

Firstly, senior manager commitment to urgent change is an important success factor. Organizations face challenges of internal change and choice of priorities. It is the art of the institutional leaders to convince internal stakeholders of the urgency of change, the opportunities to be achieved, the hard choices to be made, the sacrifices to be made but in the end the better and stronger profile to be gained in order to create the best chance for securing long term institutional survival. Without internal urgency for collaboration, a strong supervisory board with external leaders can overcome internal conflicts and help arrive at overall strategic solutions and selection of institutional focus areas.

7.1.2. All collaborating staff should feel they are ‘brand champions’

Secondly, building a strong brand valued by staff embodying institutional values is important, contributing to core university businesses of teaching and research. The case study brands all signal the collaboration’s purpose to external partners, and provide internal staff with motivation to construct collaborative shared activities. But the brand is not intrinsically valuable: its strength lies in its reflection of the valuation of the collaboration by internal and external partners, i.e. the underlying strength of the value added by the collaboration.

7.2. Collaborations can improve contribution to corporate innovation

7.2.1. Good collaborations contribute to business research, development and innovation

Effective university collaborations can strengthen business partners’ involvement, both by developing stronger research infrastructure, but also by increasing the commitment of HEIs towards business engagement. Alongside specialist engagement infrastructures, good partnership arrangements involve businesses as strategic university stakeholders in return for resources to support that engagement. This creates a virtuous circle where strong business engagement is a core part of the university claim to world-class status:

- The clearest example is Aalto, where €200m of the €700m foundation is provided by business and other sponsoring organisations.
- KIT’s multi-annual budget commits it to winning substantial third party funding (around 1/3 of its entire budget), and ETH’s Mandate includes engagement as one area of its mandate.
- Lyon has centralised its science park activities, creating a strong commercialisation infrastructure with technical centres, R&D organisations, and entrepreneurship coaching.
7.2.2. University collaboration simplifies firms identifying where expertise lies

An important but often under-appreciated element of the NIS are small and medium-sized enterprises, who can contribute substantially to high-technology growth and employment. SMEs often lack dedicated R&D teams which can hinder working closely with universities (Laursen & Salter, 2004). Good university collaborations ensure that universities do not just chase prestigious collaborations with trans-national R&D corporations, but ensure their knowledge diffuses outwards into the local SME base. But SMEs are not always well-configured for working with excellent research (although may are) and an effective mechanism for working with SMEs can ensure that world-class researchers are not excessively distracted in knowledge exchange and technology transfer, and that knowledge exchange generates resources that flow back into strengthening that research base.

One of the main advantages for collaborations is helping firms approach universities more effectively, and identify where expertise is located. Research elsewhere demonstrates that one of the most significant influences on firms considering innovation is their first experience in contacting a university (Laursen & Salter, 2004). The collaborations studied helped firms to access their knowledge, both by being clear about where their research strengths lie (profiling), and by creating specialised infrastructures that help firms to access that knowledge.

- Aalto has created cross school ‘factories’ to stimulate business engagement in areas of design, media and service.
- Lyon Science Transfer has been created centralising knowledge valorisation in Lyon
- UNE has created the best practice ‘Knowledge House’ institution which pioneered innovation voucher approaches in the 1990s including a functional expertise database

7.2.3. Private funding is important to guarantor university independence

Making industrial (external) funding more important to the universities’ finances can be important for success in reducing the dependence of the universities on a single funding source, particularly World Class excellence programmes where governments demand substantial involvement in exchange for substantial funding. Stimulating mergers and collaborations make governments much more involved in the minutiae of university decision-making, running the risk of politicising universities. Increasing other funding sources’ importance makes universities more aware of these other groups’ interest alongside the wider public good.

- Knowledge House (part of UNE) was generating €5m income for its five members for the last five years.
- KIT has two foundations, including one which supports research commercialisation and technology transfer activity by KIT researchers.
- ÖU has prioritised entrepreneurship as one of its three focal areas, (Greenhouse Öresund), ensuring that the universities’ strengths contribute to economic growth.
- In 2008 DTU entered into 701 collaboration agreements with companies, reported 67 inventions and submitted 39 patent applications, a very high rate of intensity in international comparison.
7.3. Attracting students is a key part of becoming a world-class institution

Collaboration is not only relevant for research but also other missions including education and valorisation. Becoming attractive, recognised and high quality institutions for attracting national and international ‘talent’ is an important drive for institutional collaborations. Six of our seven case studies, (viz. KIT, DTU, UNE, ÖU, Aalto, Lyon) refer to becoming attractive for students and developing high quality learning environments. The collaborations are also aimed at improving links between teaching and research, and maximising the impact that research centres have on enhancing the student experience.

7.3.1. Attracting better and more demanding students improving the learning atmosphere

Collaborations increase the scope for the development of trajectories and pathways that attract new kinds of students to the institutions. Research on world-class universities has highlighted that an important element of being world-class is attracting the best and the brightest students, something increasingly reflected in the variables used by ranking systems to generate their scores (Salmi, 2009). Helping to embed that talent within the national innovation system is an important contribution that universities can make to their NISs. A number of the collaborations have become means of developing courses between the participating institutions which attract students from beyond universities’ traditional catchments.

- Lyon has created four new specialised masters trajectories involving the universities and the Grandes Écoles in administration, materials sciences, nanotech and biosciences
- ÖU has created masters’ programmes between the eleven collaborating universities in disaster management, Finnish, Metereology and European Studies.
- Aalto University have created integrated masters programmes which draw together multiple bachelors’ programmes and create graduates with cross-field knowledge, such as International Design Business Management, which integrates bachelor graduates from business, design and technology within a single programme stream.

7.3.2. Creating returns to scale in terms of investments in new student infrastructures

Collaborative activities between universities can bring with them the opportunity to achieve economies of scale which allow increasingly niche programmes and options to be profitably delivered. This in turn allows those universities to develop reputations as centres of excellence in these fields. A number of the institutions which have merged research laboratories into universities have used these laboratories as means of undertaking specialist courses, often at the level of higher degrees, which help to attract students and create the global institutional brand of a world class university.

- Lyon has strongly emphasised this human dimension, and has integrated the 17 doctoral programmes of its institutions through the Lyon International Doctoral College.
- The laboratories integrated into DTU became six new departments fully integrated within the university, including adjunct & full professor roles, and the corresponding requirement to deliver teaching.
- UNE has created extramural talent programmes to ensure that highly talented musicians or athletes can be coached to the highest standard whilst studying full-time at one of the region’s universities.
7.4. ‘Big science’ infrastructures are a prize worth chasing, but hard to guarantee

The fourth influence is capacity to win strategic science infrastructure. National research funders must believe such facilities benefit their science base prior to investing their own funds in such facilities. Effective collaborations ensure that strategic science facilities maximise their national benefit. This gives national funders certainty that investments made will bring in matched (external) funding, creating national science assets with a high degree of allure and visibility, as well as strengthening the overall national science system.

7.4.1. Building expertise & creating visible critical mass and securing other funding

Figure 2 above highlights the point that government research centres tend to be relatively peripheral within national innovation systems. Closer relationships with universities, and even collaborations or mergers, can create benefits for those institutions by helping them to become part of a critical mass of excellent research. The examples of KIT, Aalto, Lyon, ETH and DTU all involved bringing research centres together with universities in ways that both strengthened the universities, but also enriched the environment within which the research centres were operating, e.g. involving them partially in teaching.

- KIT and Aalto are both involved in co-location centres as part of European KICs, allowing the research laboratories and universities to collaborate on European scale valorisation.
- At DTU, merger with laboratories brought a ‘fourth university mission’, public consultancy research in risk assessment and disaster management.

7.4.2. Supporting the diffusion of technology into NIS, making it a public asset

The other contribution which universities can bring through their partnerships with public research organisations (PROs) and laboratories is to improve the flow of their knowledge into the NIS through universities wider engagement channels. The issue of knowledge transfer through students is dealt with in the previous section, although involvement of laboratory researchers in core teaching activities has been an important improvement to knowledge exchange at KIT and DTU. Likewise, PROs can benefit from access to strategic infrastructure projects which are attracted to the universities rather than the laboratories’ particular excellence. These linkages help to increase the scope of knowledge exchange within the NIS.

- Aalto is involved with the creation of four of Finland’s six Strategic Centres for Science, Technology and Innovation (SHOK). In Forestry, this is adding €4m to the university’s endowment involving partnership with VTT and the sector research organisation (Keskuslaboratoria)
- KIT was the most successful German institution in FPVI, winning 209 projects with a value of more than €80m
- UNE has won two Research Council-funded research centres as collaborative partnerships between five universities and other regional partners, Institute for Local Government and the Centre for Translational Research in Public Health
8. The real benefits of collaboration to national innovation systems: a summary

Table 3 Summary of key outputs and national contributions of collaborating institutions

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>Highlights</th>
</tr>
</thead>
</table>
| Aalto University         | • €700m foundation from government and industry to provide institutional independence  
                          | • Profiling around three cross-school research projects (e.g aivoAalto: neuroimaging, social interaction and cinema)  
                          | • Cross school ‘factories’ for business engagement in areas of design, media and service.  
                          | • RAE identified 4 areas of world-class research, many areas with world-class strengths, others with opportunities for world-class strengths |
| Lyon PRES                | • Focus on three campus areas, specialising in technology for sustainable development, human sciences and medical sciences  
                          | • Lyon University won €575m from the French excellence initiative, €147.8m from local, province and regional governments and will receive further support from *Le Grand Emprunt*  
                          | • 17 institutional doctoral programmes co-ordinated via Lyon International Doctoral College  
                          | • Creation of Lyon Science Transfer centralising knowledge valorisation in Lyon, and a science park hosting two industrial technical centers, 4 research development organizations, 5 continuing professional training organizations, 80 research laboratories and 50 high-tech companies. |
| Danish Technical University | • 10 page letter sent to Sectoral Organisation (UuB) setting out DTU as a world class university around five mission areas  
                         | • Merger driven by university and laboratories on own terms in response to government demand for fewer research centres  
                         | • Laboratories became six new departments fully integrated within the university, including adjunct & full professor roles  
                         | • Merger with laboratories brought a ‘fourth university mission’, public consultancy research in risk assessment and disaster management  
                         | • DTU is a leading technological university in Northern Europe benchmarked against the best technical universities globally. |
| ETH Switzerland          | • ETH Board decides on allocation of competencies between partner organisations, and promotes knowledge exchange  
                          | • Global budgeting and performance mandate for the institution as a whole negotiated for four year period with government  
                          | • Maintained position at top of Swiss rankings and as global best performers since merger in 2000  
<pre><code>                      | • Closer co-operation became part of the last mandate and has been successfully fulfilled for the current programming period. |
</code></pre>
<table>
<thead>
<tr>
<th>Collaboration</th>
<th>Highlights</th>
</tr>
</thead>
</table>
| Öresund University     | • ÖU seen as a key mechanism for the global profiling of the Öresund Science region, as a successful cross-border partnership  
• Creation of joint technological platforms which have been successful in winning European valorisation funding (KICs)  
• ÖU helped to create a strong cross-border (DK/SE) partnership which won the €1bn European Spallation Source laboratory  
• Attraction of new businesses and high-technology entrepreneurship around universities in priority areas identified by ÖU  
• €1m of projects attracted €5m of regional funding and generated €39m of turnover in regional businesses                                                                                     |
| Karlsruhe Institute of Technology | • KIT won German Excellence Initiative Funding of €50m per annum  
• Research profiled into four centres and four institutional focuses, all in the world top competition  
• KIT was the most successful German institution in FPVI, winning 209 projects with a value of more than €80m  
• The multi-annual budget commits KIT to winning substantial third party funding from research and business sources.  
• There are two Foundations that support university research and commercialisation by KIT                                                                                                             |
| Universities for the North East | • UNE (and HESIN) repeatedly cited as examples of best practice in university co-operation and technology transfer in government reports.  
• UNE has been a single point of contact in the allocation of European Funding, Additional Student Numbers, also running a regional widening participation project  
• UNE co-ordinated a number of more peripheral projects for its members  
• Generated €5m annually technology transfer income in last five years  
• UNE has won two Research Council funded research centres as collaborative partnerships between five universities and other regional partners, Institute for Local Government and the Centre for Translational Research in Public Health. |
9. Glossary

DTU  Technical University of Denmark
EFPL  *Ecole Polytechnique Fédérale Lausanne*
EIT  European Institute for Technology
ETH  *Eidgenössische Technische Hochschule* (Swiss Federal Technical University)
ETHZ  *Eidgenössische Technische Hochschule Zurich*
ESS  European Spallation Source (High Energy Laboratory in Lund, Sweden)
HE  Higher Education
HEI  Higher Education Institution
HESIN  Higher Education Support for Industry in the North
KIC  Knowledge and Innovation Communities (part of EIT)
KIT  Karlsruhe Institute of Technology
MEE  Ministry for the Employment and Economy (Finland)
NIS  National Innovation System
OECD  Organisation for Economic Co-operation and Development
PRES  *pôles de recherche et d’enseignement supérieur*, France
PRO  Public Research Organisation (laboratory)
RAE  Research Assessment Exercise (generic, not just UK)
SHOK  Strategic Centres for Science, Technology and Innovation (Finland)
SME  Small and Medium Sized Enterprise
UNE  Universities for the North East
UoB  *Universitets og Bygningstyrelsen* (Danish World Class Universities Association)
VTT  The Technical Research Centre of Finland
ÖU  Öresund University
WP  Working Paper
10. Bibliography & references


Benneworth, P. & Vossensteyn, J. J. (2009) “University cooperation models An international exploration of experiences and appropriateness of various cooperation models” 3TU Collaboration Project working paper, Enschede, NL: CHEPS.


11. Appendix 1 Collaborative systems of governance models

- The merged model
  - Federation
  - Thematic consortium

- Strong collegiate system
  - Association
  - Lobby group