RESEARCH PAPER

The future of research universities

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The paper considers the future of the research university and finds that it is unlikely to continue adherence to a business model in which strategy is determined and directed from the top. A Mode 2 perspective suggests that the sector will contain a variety of forms, the characteristics of each shaped by the performance of centres of excellence and relevance.

Introduction

Any discussion of ongoing changes in modes of knowledge production and scientific institutions, such as universities, has a diagnostic component in what it selects as significant, and in the reference standard that is used implicitly or explicitly (whether this is a golden age in the past after which things deteriorated, or a bright future that the present should move towards). The Mode 2 of knowledge production thesis (Gibbons *et al.*, 1994) is an example, with Mode 2 undermining the dominance of Mode 1 where disciplines hold sway. If actors take up the diagnosis, it becomes performative. In a small way, this has happened with the diagnosis of Big Science as put forward in the late 1950s (see Rip, 2000).

There is some convergence in the diagnoses that are offered, in particular between the idea of an emerging regime of strategic science (Rip, 2002a, 2011a), reflexive modernization (Beck *et al.*, 2003) as visible in institutions of science (Delvenne and Rip, in preparation), Mode 2 knowledge production (Gibbons *et al.*, 1994), and the broader analysis offered in Nowotny *et al.* (2001), which can be captured as 'recontextualization of science in society' (see also Markus *et al.*, 2009). This is visualized in a diagram (Rip, 2011a), in which the 'core business' of science since the late nineteenth century [see Gibbons *et al.* (1994) on Mode 1] is increasingly recontextualized, leading to successive layers of institutions (e.g. strategic research programmes from the 1970s onward), and recent boundary interactions, which may lead to a further layer.

Research universities are one of the sites where recontextualization is played out. There are dynamics of development specific to research universities, which are interesting in their own right, but also show how concrete types of institutions struggle with the recontextualization of science in society.¹ This paper will discuss the evolution of research universities in the context of the recontextualization of science in society.

There are two main strands, both related to the challenges of governance of research universities in changing contexts. One is how the idea of a modern,

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well-managed university has to come to terms with the increasing 'porousness' of the university (De Boer *et al.*, 2002). There are also mergers and other reconfigurations turning the university into a conglomerate rather than a unified organization. The second strand works from the inside, particularly through the role of centres of excellence and relevance. Such centres are a new type of research entity, a new species in the ecology of the modern research system, which can – but need not – be part of a university.

Governance of research universities

The traditional research university flourished under the regime of Science, the Endless Frontier, which stabilized after the Second World War. Science was supported without questions being asked, because its advancement was assumed to deliver social goods – somehow. From the 1960s onwards, the growth of universities (in size and numbers), pressures from government to be accountable, and competition among universities led to a strengthening of central management. In particular, since the 1980s, new public management approaches (Hood and Peters, 2004) were embraced by the top level of many universities, and other levels had to suffer. The traditional research university was replaced by the modern research university – from the perspective of those at the top of the university. In such a modern university, as in other organizations, members were expected to share the vision and work towards realizing it (Figure 1).

The life of the university is more complex, however. It is a multi-level organization, and what the top of the university envisions may not be shared by other levels. In particular, there is the dual orientation of academics towards their institution and towards the cosmopolitan fields of science (and sometimes also domains of application) in which they move (Clark, 1983). Traditionally, the duality was resolved by



Figure 1. Opening-up and recontextualization of science in society

emphasizing academic freedom, and governance was limited to facilitation of academic work. From the 1980s onward, and stimulated by government measures, this was overlaid by a central management with its own goals for the university as a whole. Universities as institutions now became strategic actors (Whitley, 2008), saw themselves as operating in competitive markets (for students, for funding, for excellent academics), and tried to organize the university to meet strategic goals.² At the same time, the university continued to depend on the work and achievements of the research-performing groups and centres, with their own interests and dynamics. Selective facilitation of groups and centres remained important, through (or in spite of) more procedural new public management approaches.

Partly as a result of the new governance approach, an intermediate layer of deans and directors of research centres/institutes emerged with an explicit governance role (Rip and Kulati, 2011). Deans and directors of centres are under pressure from the top as well as from below, but they can be proactive, and position themselves as directors of (small or big) business units within the larger organization, with their own audiences/markets and horizontal alliances. There are implications for both top level management of the university (which now comes to resemble a holding company) and ongoing research at the bottom (where new modes of knowledge production are taken up).

More recently, there has been a move towards the creation of alliances and mergers of universities, but also between universities and public research organizations. In the Netherlands, Wageningen University and Research Centre is a (precarious) combination of an agricultural university and dedicated agricultural research institutes. In France, there have been various collaborations among universities, the national basic research organization (CNRS – *Centre National de la Recherche Scientifique*), grand organisms (such as INRA – *Institut National de la Recherche Agronomique*), and occasionally firms. The French government is now stimulating excellence through concentration, one example being the *Campus du Plateau de Saclay*, south of Paris, where 23 research organizations will be (re)settled. In Germany, the *Excellenz Initiativ* has opened up the German research landscape, and this has been conducive to new initiatives, such as the establishment of Karlsruhe Institute of Technology, a merger between the university and the big public research institute in Karlsruhe.³

Thus, the governance of the university cannot continue as it was, nor can it continue with the vision of a modern university (Figure 2). It is not quite clear how the new challenges will be addressed. The partial independence of research groups and centres will continue, and there is a general blurring of boundaries (including occasional co-location with industrial and other research laboratories and institutes). If such developments are taken seriously, the vision is of a post-modern university (Figure 3).

The governance style in a post-modern university is one of 'pooled interdependence', as Whitley (2008, p. 35) noted, with active facilitation and portfolio management at the top. Once the vision of a post-modern university is accepted as legitimate, further activities can be pursued. One possibility is that post-modern universities will start bidding for contracts to manage and deliver a research programme (there is the precedent of US universities managing research establishments funded by the Department of Defense), or win contracts to educate/train students in particular areas. Whether and how this will happen depends also on overall changes in the higher education and research systems.



Figure 2. The vision of a modern university



Figure 3. Vision of a post-modern university

Changes in the evolving research system: challenges and opportunities for universities

One of the drivers of changes in research universities is change in the research system. Research universities (even if their main function is still the education of students) are sites in the research system, and depend on its nature and evolution, as well as feeding into its further evolution. The key change over the last 30 years has been the emergence of a new regime, of strategic science, which offers 'markets' for strategic research. The category of 'strategic research' has become well established, and the definition of Irvine and Martin (1984) continues to be appropriate: basic research carried out with the expectation that it will

produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems. The shift to this new regime, worldwide, has been documented extensively (without necessarily using the strategic science label). From the early 1980s onwards, strategic research became pervasive, and the alliance forged between forward-looking politicians and science policymakers on the one hand, and a new elite of scientists promising to contribute to wealth creation and sustainability on the other hand, is now dominating science policy and science funding. Promising high technosciences, such as genomics and nanotechnologies, and climate change research are prime examples.

The new regime is more than a return to relevance. It is linked to the return to excellence,⁴ and feeds on it. The idea is that excellent research is necessary to create the broad base of knowledge necessary as infrastructure for the solution of problems. This is very evident in the recent science policy discourse of 'grand challenges'. There is an overarching policy discourse of a 'knowledge economy' or 'knowledge society' (Felt *et al.* 2007), which is referred to in general declarations, while actual regimes of distributed innovation follow their own dynamics (Joly *et al.*, 2010).

There is a new market for strategic research, with sponsors and customers creating a demand side because of their willingness to fund or otherwise support work justified in terms of grand (or less grand) challenges and new technoscientific options. A supply side has emerged where suppliers now include university groups and centres.⁵ Occasional big funding of universities by multinational corporations, continuing funding by charitable foundations (now including the Bill and Melissa Gates Foundation as a big player), and occasionally regions wanting to strengthen the regional innovation system to make it globally competitive, all make life of (and in) universities more oriented to the outside world.

In such situations, resource dependency theory (Pfeffer and Salancik, 1978) is helpful to understand types of responses of universities. Organizations, including universities, are constantly struggling for autonomy and discretion, while they confront resource dependencies, and thus external controls and constraints on their actions. Universities are special in the sense that they, more than other organizations, have to take their internal multi-level structure into account, with researchperforming groups having their own interests and resources. There are three possible business models for research universities in the present ecology of the research system (Rip and Kulati, 2011).

- (1) Classical elite universities, which continue their core business and expand on it. Successful examples are the Massachusetts Institute of Technology, Cambridge University, and ETH in Zürich.
- (2) Enterprising universities, which pursue opportunities strategically, and need to move their research resources to exploit such opportunities. Many universities created in the 1960s and 1970s aspire to such a model, and there are examples of success (Clark, 1998).⁶
- (3) Niche-occupying universities with a specific mission and linked to a dedicated constituency. Agricultural universities (e.g. Wageningen University in the Netherlands) are one example, and they have to move when their constituencies change. Private universities in continental Europe are further examples of niche-occupying universities.

In detailed studies of Dutch and South African universities, the three types of universities are evident, but so too is an interesting convergence (Rip and Kulati, 2011). Classical elite universities expand, and end up in a similar position as enterprising universities – one could say there is an 'attractor' position, as complexity theory would phrase it. Internal governance remains different, however. There is a large variety of niche-occupying universities, up to indigenous universities with no more than a teaching function.

Another observation from our studies, and one not limited to the Netherlands and South Africa, is how university administrators tend to favour new public management approaches which may well be counter-productive. The key point here is that new public management approaches tend to neglect differences between scientific fields and application domains to which the various research groups and centres relate. Any universalizing approach (same model or procedure everywhere) will thus favour some fields above others. There are ways to handle this; for instance, by asking each field to specify appropriate performance indicators. The background issue is whether the top level delegates decision-making leads to procedures (such as specifying objectives and performance measures) or makes considered choices and is accountable for them. It is the latter which can create strategic advantages.

Changes in modes of knowledge production and the proliferation of centres of excellence and relevance: the modern university bursting at its seams

Research-performing groups and centres can respond to changes in modes of knowledge production, and can also be proactive in this respect, while universities (except perhaps niche-occupying universities) cannot do so easily.⁷ What is happening is linked to the emergence and proliferation of centres of excellence and relevance, inside as well as outside universities. The term 'centres of excellence and relevance' covers a broad range of centres and research institutes, all feeding on opportunities in the regime of strategic science. In a sense, they are a new species in the ecology of current research and innovation systems. Particularly, they are key sites for new modes of knowledge production.

What does the species look like? It emerged in the 1980s, with engineering research centres in the US, interdisciplinary research centres in the UK, and the Australian collaborative research centres (Van der Meulen and Rip, 1994). Now, such centres are everywhere. For science policymakers, a key point is that they are time-limited in terms of special funding (10, maximum 15 years), but there are often other sponsors, and opportunities for resource mobilization. On that basis, a centre can survive after special funding has stopped. Such centres can thrive because there is now a market for strategic research, as well as direct support of excellence by funding agencies and independent sponsors. Thus, while they build on the longer term dynamics of research institutes and strategic science, their proliferation also reflects new policy interests.

Centres of excellence and relevance can appear in universities, whether pushed by special funding schemes or emerging in their own right. They can also be created separately, with contributions from various actors (government agencies, industry, universities). One example is the so-called 'technological top institutes' in the Netherlands, which are independent but have links with universities in terms of location and collaboration, as in the case of the Telematics Institute, close to the Twente University campus – but their geographical proximity does not necessarily imply much collaborative proximity (Kokkeler, forthcoming 2012). The Belgian institute, IMEC, focusing on microelectronics and established in Louvain in 1984, is another and very interesting example (Van Helleputte and Reid, 2004). Norway's science and innovation policy has created a whole range of such centres, with a variety of foci, such as the centres for environment-friendly energy research (Gulbrandsen *et al.*, 2010).

While the emphasis (and the labels used) can be on excellence, relevance is included, as is clear when one looks at the actual programmes funded under the German *Excellenz Initiativ*. It cannot be otherwise under the emerging regime of strategic science. The possibility of combining excellence and relevance has been identified as occurring anyhow (Rip, 1997), and has been characterized as Pasteur's quadrant (Stokes, 1997). One problem with the latter characterization is that it focuses on eminent individuals combining excellence and relevance. In modern centres of excellence and relevance, there is a division of labour, as well as mutual inspiration.

Centres of excellence and relevance have become a recognized feature of the research landscape. Interestingly, these centres offer good facilities for Ph.D. training (centres in the US use number of Ph.D. students as a performance indicator). They can also offer shorter stretches of on-the-job research training (which may contribute to a Ph.D.), and postdoc training. When such centres are part of a university, they are partly independent in terms of resource mobilization, and they can throw their weight around because they are important for the profile and competitive position of the university. The University of Twente with its MESA+ Institute for Nanotechnology demonstrates this (Rip, 2002a). Subsequent developments have shown the mutual dependency of the university and this centre for excellence and relevance, and the repercussions this has on other parts of the university.

The University of Twente is a small university (9000 students), dedicated to science and engineering, and with a strong applied social science component as well. It is an entrepreneurial university, and presents itself as such; for example, in its support of start-up firms (by now, almost 400). The MESA+ Institute for Nanotechnology has 500 staff (including technical staff and Ph.D. students) and world-class facilities, including a new clean room. MESA+ presents itself as excellent, and its academic staff have received major grants and personal awards and prizes. It also presents itself as relevant in terms of applications (for example, 'lab-on-a-chip') and start-up firms. When the Minister of Economic Affairs visits MESA+, the start-up firms are presented, but when receiving the Minister of Education and Science, the grants and awards are highlighted.

The mutual dependency between the university and MESA+ is visible in how MESA+ profits from core funding and access to students, and how the university boasts of having such a major research institute. MESA+ can blackmail the university by demanding a financial model that allows it to operate as it wants, even if other parts of the university suffer. For the time being, the tensions are accommodated, but the situation is not stable. One can envisage two scenarios to resolve the tensions: (a) MESA+ is forced out, survives independently while the university reverts to a teaching institution; (b) MESA+ is embraced (together with other such centres) and the university becomes a research conglomerate that happens to be in Twente. In neither scenario can the university continue as the modern university is bursting at its seams exactly because it houses such centres of excellence and relevance, and depends on them. If this is continued (as in scenario b), it will be a step towards the post-modern university.

Futures of research universities

The net effect of new alliances and mergers, and centres of excellence and relevance, is a university which is heterogeneous rather than unified, and has permeable boundaries. This may be perceived as fragmentation, and there are brave attempts by the 'steering core' to create directions and be selective (see Clark, 1998). Giving direction is important, but such activities must be informed by an understanding of ongoing dynamics if they are to be more than empty and potentially counterproductive bravado.

For research universities, the key challenge is to diversify and recombine its components, both cognitively and institutionally, into what we have called the 'post-modern university'. Such a university will have overlaps and/or alliances with centres (of excellence and relevance), public laboratories of various kinds (which are themselves on the move), and various private organizations managing and performing research. Within such a post-modern university, individual departments (faculties, institutes) are relatively independent and can follow their own trajectories by emphasizing certain areas in response to external developments, and by developing new combinations of research and training. In the strategically important middle layer in the university, now occupied by faculties and centres competing among each other for resources and favours from the top, an entrepreneurial element is introduced which will increase the flexibility of the institution as a whole. Traditional disciplinary departments and *Fakultäten* may well disappear in the end, but that is not inevitable; they can remain as one part of this heterogeneous *milieu*.

The overall changes in research and higher education systems create a further dynamic. For example, centres for excellence and relevance, whether part of a university or not, are well suited to offer packages of research training and have them certified (Rip, 2004). This would be a way of more rapidly accommodating research training to changes in the research landscape. Basic and strategic research may be carried out in other than traditional locations, what Neubauer (2006) calls 'third sector knowledge production'. Universities as well as basic research institutions (think of CNRS in France and similar organizations in Italy, Spain and Latin American countries) are losing their monopoly.

In such a world, research universities will have to compete with a variety of other (emerging) institutions. One scenario would be a world where centres of excellence and relevance, accredited to award Ph.D. degrees, would be the key institutions, replacing the universities for graduate education. Undergraduate education would remain the prerogative of universities (and polytechnics, technikons, *hogescholen*). It would be education of an important part of the labour force, and would have a civic function as well, as in the American community colleges. It would also function as a feedstock (and obligatory passage point) for new researchers to be trained in graduate education in various sites.

In another and partially overlapping scenario, further recontextualization of the institutions of science and the parallel broadening of what is considered valid knowledge production (see Figure 1) introduce possible new aims for research universities. Their traditional reference to disciplines, already under some pressure, would become just part of a range of epistemic resources (Rip, 2002b). This is reinforced by the recognition of what is happening in non-OECD countries, with their own versions of a knowledge, research and innovation system (Rip, 2008). Knowledge careers rather than research careers become what students are being prepared

for, and how academic staff qualifications are formulated. As in the earlier scenario, universities lose their monopoly, but now their traditional core strength may no longer be a strength.

These are scenarios, possible futures, but they are not just speculation. They select present trends, and show what happens when these continue and interact; and they open up the diagnoses involved in discussions about changes of research universities in context. Instead of a simplistic reference to a golden past or a bright future, there are articulations of ongoing long-term developments continuing into the future, and made concrete in terms of their outcomes and repercussions.

The substantial point about the future of research universities is that they cannot go on as they are. Modernist approaches to university governance from the top will not be able to address the challenges. Universities will become conglomerates, whether the top level wants it or not. The label 'post-modern university' captures the thrust, but is simplistic in the sense that it does not specify what sort of governance is required, nor what life in a post-modern university would be like. This paper has looked at some of the building blocks, such as taking the idea of an entrepreneurial university a step further, seeing research groups and centres as being entrepreneurial and following their own trajectories. While the top level of the university is prepared to be strategic in supporting some of these trajectories and not others, it generally fails to consider resource mobilization and profiling for the institution as a whole.

Universities are said to be the longest surviving of institutions, after the Roman Catholic Church. Their survival, however, is predicated on major changes in their mandate, position and inner working. While there is continuity from medieval universities, the secular universities of the seventeenth and eighteenth centuries, research universities after 1870, and the present mass education universities, it is clear that the history of the university is marked by contextual transformations which, for those who live through them, are sometimes beyond recognition. What we see happening now may be the beginning of a further contextual transformation, one in which universities cannot assume a monopoly on higher education anymore, nor a privileged position in research.

Notes

- 1. Another institution that is facing recontextualization is the research funding organization. I have developed scenarios showing possible responses (Rip, 2000).
- 2. See also how Clark (1998) makes an explicit call for a 'strengthened steering core' in his analysis of the rise of entrepreneurial universities.
- 3. Interesting also is how Göttingen University created a research alliance, the Göttingen Research Council, with five Max Planck Institutes and other research institutions in the area, and was able to do so because its legal status was changed from an exclusive dependence on the state (the *Land*) to an independent foundation sponsored by the state.
- 4. We identified a worldwide return to excellence in the late 1990s, after the move towards relevance which started in the 1970s (Hackmann and Rip, 2000). One recent example is the German funding initiative for excellence (of universities). The struggle for excellence in terms of the Shanghai ratings (a derivative rather than a measure of substantial excellence), which is visible across the globe, may well be self-defeating (Rip, 2011b).
- 5. Interestingly, as Georghiou *et al.* have shown for the UK, publicly-funded research centres are now also moving into the market for strategic research, and have to position themselves in the evolving ecology of the research system (PREST, 2002, pp.27–28). The system in which universities move to generate external income and knowledge production also involves such new actors as consultancies.

- 6. There is a large literature on the move to entrepreneurial activities in universities (see McKelvey and Holmén, 2010), with an emphasis on economic activities. This is only one domain in which universities can be enterprising.
- 7. Scientific institutions with an intermediary role, such as science funding organizations, are even less responsive to changes (Rip, 2000).

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