



## **Towards Post-Modern Universities**

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### 1. Introduction

At the same time that the modern, well-managed research university is coming into its own, it is being undermined by internal and external pressures and ongoing changes.

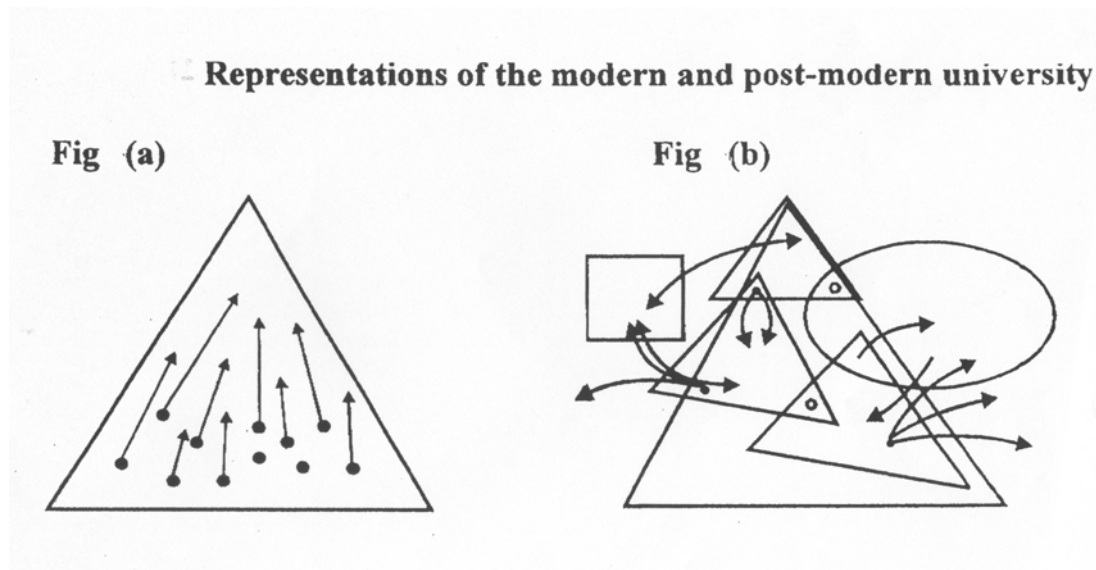
One such change is the increasing importance of strategic research: “Strategic research [is] basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems.” (Irvine and Martin 1984) Linked to this is the emergence of a new regime of ‘Strategic Science’, replacing the ‘Science, The Endless Frontier’ regime which stabilized after the Second World War. The traditional research university flourished under this earlier regime, where science was supported without questions being asked. The growth of universities (in size and numbers), pressures to be accountable, and competition, led to a strengthening of central management and attempts at research policy (addressing excellence as well as relevance), visible everywhere since the 1990s. The traditional research university was replaced by the modern (research) university (at least, in the perspective of the top of the university).

Concurrently, a new research entity emerged: Centres of Excellence (and Relevance), with core funding from government programs (this started in the US, UK and Australia in the 1980s), universities or consortia (as with the Technological Top Institutes in the Netherlands from the late 1990s onwards). Such Centres can thrive because there is, by now, a ‘market’ for strategic research, as well as direct support of excellence by funding agencies and independent sponsors. When such Centres, as is often the case, are part of a university, they are somewhat 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. In Rip (2002), I have used my own university and its MESA+ Institute for Nanotechnology as a case study. Subsequent developments show the mutual dependency of the university and this Centre for Excellence and Relevance. To put it bluntly: the university is bursting at its seams because it houses such Centres. It has to re-invent itself – or give up being a research university.

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Concerns and debate about the future of the research university are widespread. De Boer et al. (2002), in their overview, highlight the 'porous university', and rightly so. My brief discussion of Centres of Excellence and Relevance, inside a university, but also outside, or hybrid, shows that it is not just a matter of more interaction with the outside world. The (research) university may turn into a conglomerate, rather than the unified organization envisaged by the proponents of the modern university. To emphasize the contrast, I speak of the 'postmodern' university. The Figure below visualizes the contrast.



The present tensions and responses occur at two levels. One level is that of the university and how it re-organizes and repositions itself, in relation to various stakeholders and in relation to the nation state. Particularly interesting are attempts to create conglomerates. In the Netherlands, Wageningen University and Research Centre is a (precarious) combination of an agricultural university and dedicated agricultural research institutes. In Germany, Göttingen University has created an alliance with five Max-Planck-Institutes and other research institutions in the area. This had become possible because its legal status changed from an exclusive dependence on the state (the *Land*) to an independent foundation sponsored by the state. One can speculate that postmodern universities will go a step further and bid for contracts to deliver a research priority (there is the precedent of US universities delivering research programs for the Department of Defense!); but also, contracts to educate/train students in particular areas.

The other level is the one I started with: governance of the postmodern university conglomerate and the various management challenges. One entrance point is the emergence of an intermediate layer of deans and directors of research institutes, who are, in essence, directors of (small or big) business units in the conglomerate, with their own 'horizontal' alliances. There are implications, both for top level management of the

universities (which now become like a holding company) and ongoing research at the bottom (where new modes of knowledge production more easily come into their own).

I will take the emergence of Centers of Excellence and Relevance as my entrance point to discuss actual and possible changes in research universities. While they are not the only “driver”, they are a particularly interesting one, because they allow us to see the links with changes in the organization of science and in modes of knowledge production. Too often, the focus of analysts is exclusively on institutional aspects, and the actual work and dynamics of research remains invisible.

## *2. The emergence and impact of Centers of Excellence and Relevance*

Centers of Excellence and Relevance emerge everywhere, they are not limited to the context of research universities. In fact, they are a new species in the “ecology” of present research and innovation systems.<sup>2</sup>

The USA Engineering Research Centers, the UK Interdisciplinary Research Centres, and the Australian Collaborative Research Centres all started in the 1980s (cf. Van der Meulen and Rip 1994), and by now, such centres are set up everywhere. For science policy makers, the key point is that they are time-limited in terms of funding (10, maximum 15 years). There are often other sponsors, and on that basis, a centre can survive after special funding has stopped. The centres are almost always a good context for PhD training; the USA Centers have the number of PhD students as one performance indicator. They can also offer shorter stretches of on-the-job research training (which may contribute to a PhD), and postdoc training.

Such Centers of Excellence and Relevance (CER) can occur in universities, whether pushed by special funding schemes or emerging in their own right. They can also be created as such, with contributions from various actors (government agencies, industry, universities).<sup>3</sup> Technological Top Institutes in the Netherlands have links with universities in terms of location and collaboration. For example Telematics Institute, close to the Twente University campus (geographical proximity does not necessarily imply much collaborative proximity). IMEC, located in Louvain (Belgium), established in 1984, is another and very interesting example (Van Helleputte and Reid 2004).

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<sup>2</sup> Actually, one should speak of knowledge, research and innovation systems (KRIS) to capture the full dynamics. See Rip and Mouton (2006).

<sup>3</sup> Interestingly, as Georghiou et al. have shown for the UK, publicly funded research centres are now also moving on the market of strategic research, and have to position themselves in the evolving ecology of the research system where universities move to generate external income and knowledge production is carried by new actors like consultancies as well (p. 27-28 in PREST 2002).

While the emphasis (and the labels used) is often on excellence,<sup>4</sup> relevance is included; it cannot be else in the emerging regime of Strategic Science. Such Centres thrive because there is, by now, a ‘market’ for strategic research, as well as direct support of excellence by funding agencies and independent sponsors. Thus, they build on longer term dynamics of research institutes and strategic science, but reflect new policy interests as well. By now, they are a recognized feature of the (new) research landscape

Part of their characteristics derives from the way they are embedded. When such Centres, as is often the case, are part of a university, they are still somewhat 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. (See Appendix for the case study of MESA+, Institute of Nanotechnology, in the University of Twente.) The evolving mutual dependency of the university and its Centres for Excellence and Relevance may be entering – in ecological terms – a climax stage? The modern university is bursting at its seams because it houses such Centres and depends on them.

### *3. Governance of universities*

The net effect of liaison activities, centres of excellence and relevance, new alliances, and graduate networks, is a university with permeable boundaries. This may lead to fragmentation, and one can see brave attempts of the “administrative core” to create directions and be selective. While important, such activities must be informed by an understanding of ongoing dynamics 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 was called a post-modern university (Rip 2004). Such a university will include overlaps and alliances with Centres (of excellence and relevance), public laboratories of various kinds (which are themselves on the move!) and various private organisations managing and performing research. The boundaries between the university and the outside world are porous, and such ‘porosity’ is sought explicitly (De Boer et al. 2002). Partial examples are visible already, as in the close collaboration with public research organizations of some universities in France and South-Africa, or even a merger, as in Wageningen University and Research Centre.<sup>5</sup>

In such a “postmodern” university, individual departments (faculties, institutes) are relatively independent and can follow own trajectories, and emphasize certain areas in

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<sup>4</sup> We noted a “return to excellence” in the late nineties, after the move towards relevance which started in the 1970s. (Hackmann and Rip, 2000) Cf. also the recent German funding initiative for excellence (of universities).

<sup>5</sup> Cf. also the recent proposal, in the debate about the reorganisation of the French science system to have “campus de recherche” to which various current science bodies would contribute. See Donner un Nouvel Essor à la Recherche Française ([www.pasteur.fr/pasteur/dunerf.html](http://www.pasteur.fr/pasteur/dunerf.html)), one of the products of the broad movement Sauvons La Recherche, catalyzed by the funding strictures imposed by the French government.

response to external developments, develop new combinations of research and training, etc. In other words, in the strategically important middle layer in the university, now occupied by departments and faculties competing amongst each other for resources and favours from the top, an entrepreneurial element is introduced which increases the flexibility of the institution as a whole. Up to preparing for partial privatization, making deals with other universities, etc.

Traditional disciplinary departments and *Fakultäten* may well disappear in the end, but that is not necessary. They can remain one part of the heterogeneous set-up. Rip (2004) suggests that Centres for Excellence and Relevance are well suited to offer packages of research training (and certify them), whether they are part of a university or not. It would be a way of accommodating research training more rapidly to changes in the research landscape.

Think of how dramatically Electrical Engineering has changed since the 50's: from tubes to transistors to integrated circuits and sensors, actuators, as well complex systems which integrate them. Electrical Engineering Departments/Faculties now house also mechanical engineers (Mechatronics), IC-designers and micro/nano-technologists. One could argue, that a re-grouping of disciplines and curricula and their related governance structure is needed. Centres of Excellence and Relevance can do that because they are not constrained by the past (only by the future as laid out in the promises made for them).

Much in the same manner, we can look at micro/nanotechnology as a set of topics that has an interest comparable to electrical engineering some 40-50 years ago. Perhaps, micro/nanotechnology should become a new faculty? One can imagine the battle against vested academic interests that is necessary to realize such a change. One scenario could be that existing academic departments and faculties are by-passed because Centres of Excellence and Research partially replace them as locations for training.

If (when) the universities become conglomerates, there will be further opportunities for Centres of Excellence and Relevance to evolve, for example as public-private partnerships, linked to heterogeneous scientific communities. Given such co-evolution, one can speculate about the future. One scenario would be a world where Centres of Excellence of Relevance (accredited to award PhD degrees, cf. Rip 2004) would be the key institutions, replacing the universities. Undergraduate education would remain the prerogative of universities (and polytechnics, technikons, *hogescholen*), and be seen (in addition to its main role of providing higher education to an important part of the labour force) as “feedstock” (and thus obligatory passage point) for excellent and relevant researchers.<sup>6</sup>

#### 4. *The future of academic research*

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<sup>6</sup> In a brainstorming meeting organized by German BMBF, December 2007, about the changing research landscape, one claim was: “Recruitment of top scientists starts at undergraduate level.”

Often, analysis is couched in economic terms (broadly speaking), about resources and competition on a market for strategic research, which intersects (for universities) with the market for training and attracting students. And sponsors are important, adding a patronage dimension to the market dynamics.

Policy, at government as well as university level, tends to be responsive. And when proactive, often goes for new public management approaches which may well be counter-productive. In universities (as Kulati has shown), such approaches neglect the differences between scientific fields and application domains that research groups and centres relate to. A universalizing approach (same model or procedure everywhere) will then favour some fields above others, without considering their actual importance.

What I have added to these two entrance points is the phenomenon of co-evolution, in general, and specifically for Centres of Excellence and Relevance and universities. Centres of Excellence and Relevance move on the market for strategic research. Their opportunities and success will depend on what other organizations will be in place & act/intervene in the ecology of the research system. The lifeline of universities is undergraduate and graduate training. If excellence (and relevance) in research is added as a mission, it does not sit easily with this “lifeline”. Particularly if universities have to compete with Centres of Excellence and Relevance, sometimes in their own organization.

There is a future for academic research, but it may not be academic research as it used to be. Academic research may occur in other than traditional locations (cf. also “third sector knowledge production”). And traditional locations like universities may well be transformed. There are no simple, causal, determinants of this co-evolution. But one can anticipate, even if this requires being speculative. Scenarios offer controlled speculation.

This paper has identified building blocks, and articulated some scenarios. The subsequent question is whether the articulation of scenarios will make a difference. Will actors be more knowledgeable, and thus more effective? Part of my argument was about overall trends that cannot easily be resisted, even if they are the cumulative result of many individual choices and strategies. The post-modern university may need post-modern “managers” who are reflexive about the limitations to their attempts at effecting change.

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## **Appendix: Centres of Excellence and Relevance, including a case study of MESA+ (Institute for Nanotechnology) in the University of Twente**

Global characteristics of such Centres, resource mobilization, internal dynamics, etc.

Cf. B.J.R. van der Meulen, A. Rip, *Research Institutes in Transition* (Delft: Eburon, 1994), on internal and external research management.

Plus recent analysis of the evolution of three such Centres since the early 1990s (ongoing work of Ben Kokkeler).

Centres of Excellence and Relevance have become robust. They embody a secular change in the research landscape, and are thus 'obligatory passage points' for policy makers (who have to formulate their policies taking into account their presence and role), for funding agencies (who want to overcome their traditional focus on the responsive mode favouring small PI-led research projects), and for universities (which can't think in terms of individual academics only anymore).

The MESA+ case (see below) is but one example of what we claim is a general dynamic (i.e. not just a feature of nanoscience and nanotechnologies).

- other such centres (cf. Ben Kokkeler's work on CTIT in University of Twente, and the Telematics Institute, a Technological Top Institute)

- other types of universities: The University of Twente is an entrepreneurial university, and CER can be seen as part of their mission. Traditional/elite universities may be reluctant to add Relevance to Excellence, but when they now go for centres, relevance can't be avoided, it is part of strategic science. This is visible in the German Excellenz initiative of the Bundesministerium für Bildung und Forschung. What the universities who received the special funding pushed as excellent is almost always also relevant. The University of Göttingen is an interesting example.<sup>7</sup>

-further cases, incl. Stanford University, ETH Zürich, Karolinska Institute (Stockholm)

Location and embeddedness: self-standing or part of another organization (or part of a consortium/network). In particular in universities, where they are embraced and supported, but also constitute a challenge. Case of MESA+ (Institute for Nanotechnology) in University of Twente to illustrate this last point.

The University of Twente has a regional orientation, but also an international reputation for advanced technology. The University started, in 1964, as a technological university, and has since added applied social science (it calls itself, in its letterhead, "university for technical and social sciences," and now also "the entrepreneurial university").<sup>8</sup> It is

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<sup>7</sup> Further examples and analysis from Tembile Kulati's study comparing university research management in South Africa and the Netherlands.

<sup>8</sup> Burton Clark has analysed a number of "innovative" entrepreneurial universities, including the University of Twente, and attempted to find a general pattern. Burton R. Clark, *Creating Entrepreneurial Universities. Organizational Pathways of Transformation*, Oxford, Pergamon, 1998. The universities he studied are all members of the ECIU consortium (European Consortium of Innovative Universities (ECIU), *Charter*, signed at Dortmund, November 18, 1997.) We will critically refer to his ideas.

primarily because of its advanced work in some key technology areas, including materials, micro-systems, and information and communication technology that big firms are now interested in strategic links. A variety of spin-off firms have been established, building on university research or sometimes just on the entrepreneurship of graduates.<sup>9</sup> Since the late 1980s, outward-looking, problem-solving research centres (in materials, lasers and ICT high tech, biomedical technology, but also in applied social science) which reflect faculty interests even if the centres sprung up outside departments. By now, this has led to an overhaul of the university management: the scientific directors of the officially recognized five research institutes are at the same level as the Deans of the Faculties, and together form the university's Management Team (with the Executive Board of the University).

At the same time, the circulation of students and graduates (not discussed by Burton Clark) creates patterns. They are trained in the new centres of excellence and relevance, and they remain part of networks when they start out on their jobs, or perhaps start up a business of their own. They contribute to the embedment of the University in the world of Strategic Science, and this may well be more important than further strengthening of the administrative core (which Burton Clark emphasizes).

MESA+ builds on the interest of governments, especially EU, in the promise of nanotechnology, as well as more concrete interests of Dutch and international firms. It plays a key role in the Dutch R&D consortium Nanoned, including funding for major research infrastructure (NanoLab) also located in Twente, and now further government-funded investment in a "high tech factory" for SMEs. While the university welcomes this, it also strains its existing organization and procedures. [Details can be given.]

We have sketched MESA+ as a Centre of Excellence and Relevance which maintains its viability inside and outside the university by emphasizing the combination of excellence and relevance – which under the present and competitive regime of Strategic Science implies being excellent as well as relevant, no trade-offs are possible. In being successful in these terms, MESA+ is also becoming somewhat independent of the University, even while it is strongly committed to it, and draws on the University for key resources. To draw up scenarios of future developments, one can start with two extreme versions, triggered by the question whether MESA+ should remain within the University of Twente or not (a "fork" in the further development). This need not imply full privatization (even if that is a possibility, cf. also the reorganisation of the New Zealand science system in the 1990s, where public research institutes and in the beginning also universities had to include all their costs and conclude contracts with the Ministry on that basis). The Belgian Centre IMEC is an example of a non-university Centre of Excellence and Relevance, with core funding directly from the Flemish government, in return for regional (and national) benefits.<sup>10</sup>

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<sup>9</sup> Between 1976 and 1997, close to 300 firms have been started as spin-offs from the University. The special TOP scheme (Temporary Entrepreneurial Positions) started in 1984, and supported about 75% of the firms established in the period 1984-1997, with a five-year survival rate of 89% and generating a total of 1,400 jobs (Van der Sijde and Van Tilburg 2000).

<sup>10</sup> As Van Helleputte and Reid (2004) show, this pushes IMEC into closer interactions with firms (than MESA+ does now), without giving up on excellence.

One scenario starts with forced independence: the young cuckoo (MESA+, but also other Centres of Excellence and Relevance) is thrown out of the university's nest before it endangers the own young birds. MESA+ would have to find a new business model, probably including deals with the government and/or a consortium of sponsors, as is the case for Technological Top Institutes in the Netherlands. If nothing else happens, the University would then evolve towards a teaching university, merge with Saxion Hogeschool, and link up even more with regional interests, including regional start-ups. At some moment, reflection on regional relevance in an era of globalisation would lead to attempts to identify comparative regional advantages in terms of industry and services, rather than scientific excellence. To build up regional economy and regional innovation system requires long-term investment decisions – in partial contrast to the tendency of excellent scientists to move “laterally”, and so not wanting to be bound by the regional strategy.

In the alternative extreme scenario, the University embraces the Centres of Excellence and Relevance, and reduces other research activities in order to support the Centres. Advanced teaching and research training becomes focused on the Centres (and for good reasons: they exemplify the settings of the scientific careers of the future). Excellence and general global relevance will prevail, the region will be of secondary interest at best. While the University of Twente happens to be in Twente, it could be anywhere. It is a holding company for a number of Centres of Excellence and Relevance.

For the region, this might mean that is being colonized. There are developments towards so-called “science districts”, however, where the region is redefined as the site of high-level scientific activity. An example is the Grenoble area, already strong in biotechnology, and now pushing towards nanotechnology because of the strong move of the institutes of the Commissariat à l’Energie Atomique in the direction of nanotechnology (MinaTec) together with R&D investments of big companies like Philips and Motorola in the region.<sup>11</sup>

In the near future, a situation may well prevail where no clear strategy is followed, also because each of the two extreme scenarios are too daunting in their consequences to be entertained by the university. A “muddling-through” scenario is a possibility, where nobody will be happy. A more interesting third scenario draws on the trend that (perhaps after some time of “muddling through”) Centres of Excellence and Relevance of various kinds, not necessarily part of a university, become generally recognized for their potential to address important issues and become a regular feature of the research landscape (established as such, or as a development started within a university). In such a landscape, there are opportunities for universities to redefine themselves.

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<sup>11</sup> A comparative study of the Grenoble region and Twente as potential “nano-districts” was done as part of PRIME, the European Network of Excellence in science policy and innovation studies. See Mangematin et al. 2004.