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9. THE STRATEGIC RESPONSES OF ENGLISH AND DUTCH UNIVERSITY LIFE SCIENTISTS TO THE CHANGES IN THEIR INSTITUTIONAL ENVIRONMENTS

9.1 INTRODUCTION

The governing of publicly-funded research in the Western European countries has become multi-dimensional and multi-layered (De Boer et al., 2007, Leisyte et al., 2010, Whitley et al., 2010). Increasingly, the role of various intermediary bodies, such as research councils, has become important in external funding of university research. Competition for resources and changing state steering of research through various policy mechanisms, such as performance-based funding, accountability, quality control and performance measurement have been brought to the fore. In part, higher education and research reforms, largely inspired by New Public Management approaches, aimed to make the systems and their organisations more efficient and effective by providing more power to managers in public universities. In such a context, the initiatives and actions of external funding bodies and university managers are likely to have changed the rules of the game for researchers. It is still poorly understood how university researchers respond to these attempts to change these rules. How are their institutional environments reshaped and how do they respond?

This chapter addresses this knowledge gap by providing insights based on a comparative study on how academic units in public universities in life sciences respond to the higher education and research reforms[1]. The goals of this chapter are therefore twofold: (1) to characterise the changes and potential effects of the institutional environment for life scientists in England and The Netherlands and (2) to explore the strategic responses of life scientists to these challenges.

Our contribution starts with the theoretical framework which provides a typology of strategic action of research units. Furthermore, we describe the methodology of the study and highlight the conceptual underpinnings of understanding steering of research in public research systems. This is followed by examples of changes in steering research that life scientists face in two research systems, England and The Netherlands. The empirical evidence of strategic practices of university scientists are presented in the fourth part, which is followed by a discussion and conclusions.

9.2 THEORETICAL CONSIDERATIONS

The theoretical underpinnings of the sociology of science and the sociology of organisations prove to be helpful to understand the dynamics between the institutional

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environment and the strategic action of researchers. The laboratory studies in the sociology of science in the 1970s produced a conceptual understanding of how scientists function within their institutional environment. In particular, the credibility cycle model introduced by Latour and Woolgar has been helpful in understanding academic research practices in which inputs (ideas, problems, methods) are turned into outputs (funding and reputation) in order to build academic credibility (Latour & Woolgar, 1979). It draws attention to the importance of reputation and credit within the academic community. The extension of this model in later accounts points to the shifting audiences that academics address and the possible conflicts this may cause. Changing institutional environment may mean different expectations from academics of what and how to research. In essence, what counts in the end is the academic's ability to convert the work in order to make it count for different audiences (Knorr-Cetina, 1982; Lehenkari, 2003). Thus, the creation of credibility occurs in several areas that interact – research sponsors, the scientific community, regulatory authorities and university management (Leisyte, 2007). These audiences are important in the institutional environment, as they influence the rules, norms, values, and beliefs that may either facilitate or obstruct the credibility building process of research groups.

Oliver's (1991) typology of strategic action is useful to understand how research groups react to changes in their institutional environment. According to her, based on the resource dependence and the neo-institutional theories of organisational sociology, research groups act through particular strategies created and implemented in response to the changes in the institutional environment. Based on her typology, we derive the following strategies that research units can use:

- Conformity to external rules and norms and interests of stakeholders. The conformity strategy means adherence of research groups to the myths and ceremonies within their institutional environment, even if it means changing their core activities.
- Symbolic compliance. The symbolic compliance strategy means the buffering of research groups' activities from the formal structure, de-coupling the core activities from the requirements in the institutional environment.
- Pro-active manipulation and negotiation of the environment. This strategy is seen as a high level of resistance to an institutional environment and influencing the environment according to the research group's preferences.

The type of strategy pursued in action implies the ability or inability to maintain the status quo in the researchers' activities. If a research group follows a conformity strategy, it may imply a change of the core activity, such as setting the research agenda according to the requirements of the institutional environment and thus restraining academic freedom to a certain extent. On the other hand, if researchers choose a manipulation strategy, it can determine their own research agenda and even influence the agenda setting within the institutional environment.

9.3 METHODOLOGY

The empirical data come from the documentary evidence and interviews with the four biotechnology research groups. The selection is based on theoretical sampling

of research groups in research universities in The Netherlands and England (Yin, 2003). The contrasting cases were selected to account for the different institutional environments of research groups. The major criterion was the estimated research quality of the biotechnology groups. It is based on the assumption that the reputation of a research group based on its quality may influence the knowledge disclosure behaviour. Therefore, we distinguish between 'high achievers' and 'middle achievers' among the research groups in life sciences, based on the available RAE evaluations and the evaluations of Dutch visitations to account for the different levels of academic capital. We called the English research groups A and B and the Dutch research groups C and D. Table 1 provides the overview of the selected cases.

In our study, the unit of analysis was research groups in departments, institutes or research centres that have their own administrative, physical, and academic existence. These research groups have their own organisational behaviour and setting and are supposed to act on the basis of the group's interests and those of its individual members. Life sciences are considered to be a typical Mode 2 field of research, as noted by Gibbons et al. (1994) in their study of the relationship between policy and developments in academia. The major characteristics are fluidity; problem-oriented transdisciplinary knowledge organised more loosely in changing teams; applying relevance criteria for research; and networking with corporations and their research units, hospitals, and non-university public research institutes (Rip, 2002, p. 46). More concretely, biotechnology is a relatively young sector that has boomed in the last three decades.[2] Modern biotechnology[3] may date from the development of gene slicing techniques. The new technology experienced a honeymoon in the 1970s and 1980s, during which many of its scientific pioneers and innovators concurred with speculation over the dramatic benefits for human health and welfare to be achieved in the coming decades. Life sciences are at the core of this research field, but they go alongside informatics, physics, material science and engineering (Enders & Schmoch, 2010).

The data collection implied using multiple sources of evidence under the rationale of triangulation (Yin, 2003). The study used documents, literature, and semi-structured interviews. The documents and the literature address the period since the 1980s. The interviews took place from October 2005 to January 2006 and were repeated from March to November 2008 in The Netherlands and England. 66 interviews were conducted with researchers, university managers, and policy-makers. During the follow-up visits, most interviewees were the same people as during the first visits (except for postdocs who have mostly changed). However, in the Dutch D research group (weaker group), we could not access the same group. We therefore

Table 1. The cases

Field of research	*England*	*The Netherlands*
Biotechnology	Case A (strong case) Case B (weak case)	Case C(strong case) Case D (weak case)

interviewed a group with similar standing and which was also working in life sciences in the same institute to ensure similar institutional environment conditions. This will have to be taken into account during the analysis stage and we will label D1 the group visited in 2005 and D2 the group visited in 2008.

9.4 CHANGING INSTITUTIONAL ENVIRONMENTS OF RESEARCH GROUPS

The steering of public research systems can be pictured in terms of five governance dimensions: state regulation, academic self-governance, managerial self-governance, competition for resources and stakeholder guidance (Schimank, Kehm & Enders, 1999, De Boer, Enders & Leisyte, 2007). State regulation concerns the traditional notion of top-down authority vested in the national government. In the context of research, this dimension can be understood as state programming of research at universities. Academic self-governance concerns the role of professional communities in determining the course and outcomes of the game. Managerial self-governance concerns hierarchical steering by university leaders. Competition for resources refers to a market competition where the invisible hand of the market influences the quality and allocation of goods and services. Stakeholder guidance refers to the activities that are carried out through goal setting and advice by the relevant stakeholders in the public research sectors.

In higher education and research systems these dimensions can no longer be seen as mutually exclusive options – they coexist (Enders, 2002). We will use the dimensions of research governance to understand the institutional environment of the research groups under study.

9.4.1 Research Programming by the State

England was an early adopter of the changes in higher education and research governance and related authority relations in the 1980s, whilst the reforms in The Netherlands took place somewhat later and in a lighter fashion (De Boer et al., 2007, Leisyte et al., 2010) Traditionally, in England, the public research system was not strongly regulated by the state. Less than half the university budgets comes from the State. Most of the funding comes from tuition fees, research performance related funding and contract research (Leisyte, 2007). However, state steering started to change with the introduction of new funding and quality assurance schemes which strengthened the regulative authority of the State (Leisyte et al., 2006).

The idea of national research programming by the research councils is particularly interesting in the field of life sciences where everything changes rapidly. Life sciences knowledge is quickly outdated. New significant insights rapidly follow each other. This requires continuous investment in equipment and teams of people with different kinds of expertise working on particular problems (Freeman & Barley, 1990; Orsenigo, 1989; Kenney, 1986; Houwink, 1989; Enzing, 2000). A certain level of research programming is indicative in life sciences in England, since this field very much depends on external research grants and is expensive. The strengthening of research councils has meant a certain programming of research, since funding is

distributed according to thematic areas. An important intermediary body in life sciences was established in 1994. The Biotechnology and Biological Sciences Research Council (BBSRC) has become the leading funding agency for academic research and training in the life sciences in universities and institutes throughout the country. It aims to invest in science in universities, better fund students and infrastructure, and wants universities to be more transparent and accountable to it. The BBSRC invests some €448 million annually in biosciences, the major beneficiaries being the universities.[4] This funding is competitive, most of it being distributed according to the responsive mode (e.g. €139 million in 2007–2008). Interestingly, the BBSRC suggests that, before applying for these grants, researchers should check its priority list where they can find both research and policy priorities. The website displays the full range of BBSRC's strategic priorities. Examples in 2010 include research on ageing, bio-energy, global security, bio-nanotechnology, systems biology, animal health and crop science. As indicated in our interviews, life scientists read these priorities as 'guidelines' which need to be followed and as overall themes into which they need to fit their research in order to be funded.

In The Netherlands, we see a growing interference of the State in research policies. Specifically, biotechnology research has been encouraged since the early 1980s. The ambition of the Dutch government is to be one of the main players in the fields of genomics and bio-informatics.

Research programming was first included in the policy agenda in 1979 and gradually gained in importance through an increasing variety of policy instruments, such as thematic funding and national initiatives such as BioPartner[5] to boost, among other disciplinary fields, life sciences,. Besides the two Ministries – that of Education, Culture and Science and of Economic Affairs – , intermediary bodies such as the Research Council (NWO) and the Technology Foundation (STW)[6] have played an increasingly important role in providing funding for certain areas of life science research. The Dutch life sciences innovation policy focused on incentives for life sciences research and the transfer of knowledge. In the following decade, emphasis was placed on creating favourable preconditions for business activity. Partly on the basis of a comprehensive benchmark with countries abroad, an action plan was set up at the end of the 1990s which resulted in the BioPartner programme which began in 2000 and encouraged entrepreneurship of universities and created a specific infrastructure to support life sciences spin-offs.

In 2001, with the creation of the Netherlands Genomics Initiative, a large financial impetus was provided for the life sciences. This five-year priority programme was funded by a consortium of five ministries and located in NWO, although it was not controlled by it. New centres of innovation and research clusters have been developed at universities and many programmes and projects have been introduced. Another example of a governmental programme to foster life sciences comes from the Ministry of Economic Affairs. In the period 2001–2007, it contributed €205 million to strengthen the knowledge infrastructure of the life sciences and offered €86 million for subsidies through the BSIK programme. BSIK aimed to strengthen the research infrastructure by giving competitive grants to public-private consortia that conduct research in selected priority fields, such as genomics and life sciences, micro-

systems, and nanotechnology (Leisyte, 2010). Additionally, it aims at reducing and simplifying the rules, strengthening international networks, and clear communication to society and encouragement of university entrepreneurialism. Each of these plans is accompanied by financial incentives.

9.4.2 The Second Governance Dimension: Competition for Resources

The 'value for money' and other market-related logic have slowly penetrated into the political discourse and the subsequent reforms of university governance and funding. In particular, the strengthening of funding and research councils which increasingly distribute money on performance-based criteria (via the Research Assessment Exercise, as of 2014 – the Research Excellence Framework) has started to play an important role for universities since they increasingly need external research funding to support their activities. The dependency on external funding in life sciences in England has been further accelerated by the full economic costing (Leisyte, 2007), which suddenly made the other external funders, such as trusts, less attractive. Charities, such as the Wellcome Trust, the Cancer Research Campaign, or the Imperial Cancer Research Fund, which are important for life scientists in England were no longer very welcome funders, since they do not cover full economic costs for universities.

Given such a context, the competition for research council funding has reportedly been increasing in universities in England, where roughly one third of their income comes from the funding council and the rest from tuition fees and external grants and contracts (Ibid.).

In The Netherlands, competition has been increasing through contract research at universities and increasingly competitive research council funding. An important element of various state initiatives mentioned earlier is to enhance competition. Although, historically, universities have largely been funded through the first stream of funding and according to the number of students, the funding mechanisms have gradually changed over the years towards more output-based funding, where the income from research councils (the second stream of funding) and third stream (contract research) have gained in importance (Jongbloed 2007, Leisyte 2007). However, this change was more gradual than in England, since competitive funding makes up to one third of university budgets and university income from the state remains relatively stable.

Steadily decreasing availability of institutional funding for PhD students and equipment has meant greater competition for external funding for interviewed life scientists in The Netherlands (Leisyte, 2007). They found themselves in a situation where a constant upgrading of very expensive infrastructure was vital for them to be able to carry out research which required external funding sources (Ibid.). Taking the above into account, the conclusion must be that academic units are increasingly functioning in a competitive funding environment, where obtaining external grants for research project, infrastructure, materials and student scholarships, and participating in prestigious national schemes has become the name of the game.

9.4.3 The Third Governance Dimension: Maintaining the Academic Core Intact – Academic Self-Governance

Traditionally, in both countries, academic self-governance was strong, both in internal and external governance of universities. Life scientists played a strong role in setting research agendas in their own respective academic communities.

In the English higher education and research system, the power of university life scientists has been prominent when it comes to external governance (Leisyte et al., 2006). Since the inception of national research evaluation and research councils, the interviewed senior scientists have been active in ensuring membership in the key RAE committees, in the BBSRC committees, as well as in the professional groups, such as big infrastructure or life sciences national programmes. Hence, their power in setting research priorities externally has been reinforced through active participation and shaping research funding priorities. However, when it comes to internal governance, academic self-governance seems to play a lesser role, with fewer committees at universities which have less say in strategic management issues. Academics find themselves in the layers of rules, action plans, strategies that come top down from the university management. However, informal negotiations within the institutions still have ground. Thus, academics have less power within the institutions (Fulton 2003).

In the Dutch context, the participation of senior academics in national research evaluations who also have a say in funding distribution committees of the research council (NWO) and shaping national priority funding schemes in negotiation with the Ministries shows that academic self-governance still holds in the system (Hessels, 2010, Leisyte, 2007, Van der Most, 2009).

9.4.4 The Fourth Governance Dimension: Stronger Demands from University Management

A further challenge for life scientists comes from their leaders and managers. Traditionally, university governance has been strongly influenced by the logic of the professional guild of academics. Academic self-regulation as a coordinating device has been central. But with the advent of New Public Management-inspired reforms, including attempts to rationalise university processes (De Boer et al., 2007, Krücken & Meier, 2006), university leaders and managers have started to streamline decision-making processes and to foster accountability and incentives schemes geared towards performance and efficiency. Overall monitoring and 'carrot and stick' policies have become increasingly commonplace (Leisyte, 2007). As part of the rationalisation, university attempts to profile themselves and individualisation in large part meant reorganisation of the institutions, separation of teaching into departments and research in institutes, interdisciplinary structures and further encouragement of fluidity and flexibility in the university as an organisation. The power of managers has been further strengthened by the national 'clubs' of university managers, such as Universities UK or VSNU. Furthermore, a new type of professional manager has appeared, such as deans who are appointed and not elected and do not necessarily come from academia. Their goals and interests are not necessarily the same as those

of the academic staff. For life scientists, this trend, which is pronounced both in England and in The Netherlands (although one can argue, more extreme in England, especially in the post-1992 institutions) has meant more performance reviews which, in turn, have led to awareness of the importance of producing outputs and acquiring external funding (especially in the case of the RAE-driven UK system). Organisational restructuring, encouragement from the management to obtain external grants and visibility, and collaboration with the region and industry, and at the same time, cut back on institutional funding seem to be a reality in both higher education systems (Leisyte, 2007).

9.4.5 The Fifth Governance Dimension: Demands from External Stakeholders

Academic research planning increasingly incorporates the participation of external stakeholders either through university governance arrangements or through accountability to society. The number of stakeholders playing an active role in biotechnology is large: the government (e.g. for the public health and economic reasons), society (e.g. for moral issues), the public knowledge providers (e.g. universities), and private knowledge providers and users (e.g. multinationals and SMEs). They all seem to have good reasons for being engaged in biotechnology matters. Life sciences have not only academic and economic relevance, there are also moral issues attached, such as the production of genetically modified foods. In other words, there are academic, economic and political drivers at play.

Stakeholder guidance is visible in the governance of universities in England. For example, the board of governors, policy formulation and discussions of the RAE criteria all include lay members. In life sciences, lay members voice concerns about ethical issues and have been very powerful in voicing concerns about certain types of research in biotechnology. In the 1990s, biotechnology policies were rather incremental. But when genetically manipulated food became a public issue, this changed all of a sudden: there was strong political action and a rather comprehensive policy was rapidly formulated. The key outcome was that the benefits of biotechnology could only be achieved with the help of an informed debate that reflects the concerns of different stakeholders. The government opened up the proceedings of its expert advisory committees and developed the advisory network on biotechnology (Leisyte, 2007).

In The Netherlands, stakeholder participation is visible in supervisory boards of the universities which consist only of external stakeholders. The authority of stakeholders in life sciences and university governance is more important today, since they are the source of the 'third money stream', that is, contract research which may be an important alternative for scientists to broaden their financial base. In life sciences, societal concerns are also voiced about biotechnology. Like in England, the government is not only aware of the economic benefits of biotechnology, but also of the potential dangers and the resistance or hesitation in society.

To summarise, in both countries life scientists are facing various changes in the institutional environment. However, we can see certain differences in terms of challenges. The striking difference between the two countries in the context of

our study is the specific functioning of the RAE and its importance for public funding, reputation, the capacity to attract other research-related funding and promising talent, and its impact on institutional strategies. The English research units clearly perceive the RAE and its nested effects as a key determinant of their standing and future prospects. The Dutch research units identify traces of similar elements in their changing environments, but nothing compared to the comprehensive and striking effects of the RAE.

Life scientists perceive different changes in their institutional environment concerning the need to seek external funding, and the competition for resources and publications. Collaboration and competition for resources are ingrained in their field and form part of the well-established realities of their work environments. However, they are concerned about increasingly fierce competition for funding and staff positions which are partly attributed to changes in their institutional environments and partly to the sheer growth in their field of research. Moreover, as seen from the interviewee opinions they are dissatisfied with what they experience as increasing management intrusion in their work practices and related restrictions, the encouragement to commercialise their knowledge base, and the constant monitoring of their outputs (ibid.).

9.5 STRATEGIC RESPONSES OF THE LIFE SCIENTISTS TO THE CHALLENGES OF THE RESEARCH REFORMS

Researchers in the four investigated research units were using a range of coping strategies. Their strategic action has been part and parcel of the micro-politics of the departments and the faculties under study (Enders et al., 2009). Both the Dutch and the English life sciences research units largely preserve their self-steering mechanisms that are based on their own incentive system and are linked to scholarly advancement, peer review, and academic rewards. Academic affiliations, their routines and the knowledge society's dependence on academic expertise help research units to resist change. They do this by de-coupling their core activities from formal requirements. Apart from symbolic compliance, the most frequent strategy we witnessed from research units was the use of pro-active strategies to influence their environments to decrease their dependencies. Research units also make use of ambiguities of their research environment. For example, research councils may be active in 'steering' research in certain directions and concentrate on 'fashionable' mainstream research areas. We find evidence in our study that such programmes tend to be designed in such a way that quite a variety of themes can 'fit' such programmes. Equally, university management can assume the role of a buffer that cross-subsidises different research units and gives them leeway to improve their research performance with the help of different incentive mechanisms, such as matching funds. We shall now present and discuss the use of the three strategies by life scientists in the four cases.

9.5.1 Symbolic Compliance

The most popular strategy among the life science research units was symbolic compliance. Life scientists live in constant pressure to secure external funding

both from their departments and from central university management. This makes researchers cautious about preserving their freedom of choice of research topics and mostly makes them seal-off the attempts to steer their research interests. Their professional autonomy and standing in their academic communities are paramount. For their problem choice, they value their own agenda and academic peers' opinions more than the research programmes and themes of the external and internal financial backers. They are also aware of the potential costs of major changes in their problem choice in terms of losing part of their expertise and reputation. Striving for academic reputation certainly still fuels the credibility cycle. They attempt to preserve their long standing research lines and adhere to the norms of the academic world, where mutual exchange within the academic community and peer-review are expected to provide guidance in problem choice (Henkel, 2000). In practice, however, the major providers of resources, such as external sponsors, also affect their problem choice. These external sponsors have their own research agendas even though these are partly negotiated with representatives of the academic community. We have found evidence that researchers try to strike a balance between their own research interests and the thematic priorities of their sponsors and use strategies of 'fitting' their interests into the broader themes of external financial backers. In many cases (especially in England), the research groups institutionalise mechanisms that support researchers to write proposals in a strategic way in order to increase their success rate. This collective attempt to ensure the crafting of proposals that 'fit' the priorities of the external funders highlights again the importance of these external resources. It is also an example of the possibility of academics to pursue their own topics. In some cases, the research units see no alternative but to follow the 'prescribed' research topics, which, in fact, can be considered a threat to their long standing research lines.

Our findings show that the capacity to resist externally prescribed research agendas depends on the research unit's and individual researcher's credibility. The high credibility units are more likely to resist external research agendas and have been able to carry out research of their own liking. This capacity is also related to the stage of a researcher's career. Junior researchers and their senior colleagues admit that there is not much room to manoeuvre when academic credibility is low and there is not much experience to back up the research proposals. Past performance is important for academic autonomy and because junior researchers usually do not yet have a very strong track record, they are more likely to follow the externally determined research agendas.

We also found nearly inexhaustible creativity of researchers in 'fitting' criteria of 'relevance' of external sponsors and simultaneously maintaining their own research interests. Life scientists in the studied research unit are familiar with 'selling' their research, i.e. making it relevant. For instance, one research group focuses on a bacterium which is widely used in dairy products and helps the digestion process. They point to wide applications and links with industry and the health care sector. Such strategic responses to the growing expectations regarding the relevance of research have also been observed by others (Morris, 2004; Ziman, 2000).

They do this mainly by strategically writing project proposals and manipulating research agendas. Such behaviour implies resistance to change and mediates external

attempts to influence internal research agendas. At the same time, funding opportunities mediate the problem choice of the units and their researchers who need a certain flexibility and capacity to adjust their topics to increase the chances of being funded. Research units and researchers are more likely to be affected by such resource dependencies if they face high uncertainty and possess low credibility. When this is the case, the likelihood of changes in problem choice increases and researchers will either adapt to the requirements of their resource environments or will be forced to do this by 'managerial intervention'.

9.5.2 Pro-Active Manipulation

All research units use pro-active manipulation to diversify their funding base. The professors of the groups make sure they participate in research council panels or national life sciences programmes in order to influence research agenda setting and reassert their academic power. This is especially true of the top performing groups, where the leaders that form the national elite encourage their colleagues to participate in research council peer-review panels and committees. The research units actively extend their funding portfolios by tapping into the national life sciences funding, EU funding and industrial funding. The lower scoring units have formed many alliances with hospitals and other industrial partners to obtain both credibility and funding. This strategy aims to achieve a threefold goal of gaining more legitimacy in the eyes of the university management, positioning themselves better among competitors, and freeing their hands from teaching. In the case of the top performing units in England, the funding they secure in such ways gives researchers the opportunity to remain within their preferred areas of research and follow their interests. It is made very clear by the department management, however, that if a certain area can no longer be funded, they must turn to a different area or to teaching and administration. The key goal is to secure public funding directly or through alliances. For example, one of the Dutch research units was active to enter a strategic alliance with a bigger national research institute in order to facilitate contracts with industry and obtain more stable third flow of funds. The other Dutch research unit became part of a network of excellence which secures remarkable funding for equipment. This move gives them credibility and strengthens their position in the university. Finally, the research units also partner with other units in the same university to unite forces in external funding initiatives.

9.5.3 Conformity

Life science units in both England and The Netherlands show conformity to the increased workloads in teaching and research. They work overtime to maintain the legitimate routines of research, to continue building their research reputation, and not to lose out in their credibility building processes. At the same time, they acknowledge the need to 'earn money' for the department and loyally carry out their teaching and administrative responsibilities, even though these do not count as much for their research credibility, but are seen as a common economic good for

the department. For example, the lower performing English research unit had to comply with university management requirement to shift the practices of researchers from research only to half research and half teaching. Moreover, it also had to comply with industry secrecy requirements and was unable to publish some of its research. The compliance with industry's publishing requirements is seen by the research unit as a lock-in for their academic credibility

The speed and rhythm of producing outputs are also increasingly influenced by changes in the institutional environment. Expectations regarding a certain quantity of respected outputs have risen and the research units need to balance this with their major academic criterion – quality – that remains at the forefront of their considerations about outputs. Life scientists must deal with a precarious balance between the norms and practices in their field, the need to satisfy the requests of external and internal evaluations, and the expectations of their financial backers.

Irrespective of the credibility and level of uncertainty of the research unit, all of them comply with the demands to speed up their production cycle, especially those requests linked to the further fundability of their research. In fact, this is changing the routines of output production of all units, including those with high credibility: they all produce the expected number and type of publications more rapidly. Changes in their institutional environments certainly affect the resource base of the groups, speed up the production processes, and increase competition in the race for the greatest impact journal articles.

In one of the cases, the lower performing English research unit also uses conformity strategy when choosing research problems. Some researchers in this unit comply with the priorities of funding bodies by adjusting to fundable topics and thereby compromising their research lines. This was the case when the area of research was no longer fundable by research councils or no longer fitted into the contract requirements of industry. The research unit also complies with the demands of the internal quality monitoring that is imposed by the university management. As a consequence, they opt for a twofold publication strategy. On the one hand, the team targets high impact journals and on the other they try to publish as often as they can.

9.6 REFLECTION AND CONCLUSION

The analysis has shown that respondents use strategic action when it comes to 'playing the game' of university management or receiving external funding from financial donors. The life science research units are using certain dominant strategies. More precisely, the strategic choice depends on the research units' positioning and the conditions they face. The high credibility research units can pro-actively influence their institutional environments, using manipulation strategies to obtain further stability and enhance their position. They are able to keep their core activities intact. In high credibility and high uncertainty cases, the research units retain stability in most of their activities, using predominantly symbolic compliance strategies. Conformity strategies are largely found among low credibility research units that cannot fully mediate pressures to change.

On the other hand, all three types of strategies are being used by all research units, irrespective of their credibility or financial viability. In reality, we see that all groups are trying to protect their academic core activities by de-coupling their technical core from trouble in the environment, albeit with different success. As argued earlier, the widespread attempt of the research units to symbolically comply with the change in their institutional environment is in line with the neo-institutional theory. We also observe that the groups cannot ignore changes in their environment when they concern their funding base and their reputation. This forces weaker units to change their activity profile. At the same time, these show a capacity to 'play the game' even if they have high uncertainty in the environment and try to be pro-active, even though they are less successful in this respect. All the groups play with the fact that they have multiple stakeholders and sponsors in their institutional environment. They also hold multi-task work portfolios they can try to use to counter-balance the increase of uncertainty in their environment. Thus, the need to reduce uncertainty and obtain resources does not necessarily lead to conformity strategies and change in the work practices of 'weak' research groups as they use multiple means and ends to boost their resource base as well as credibility. This provides means that allow even 'weak' research units to be more active and to try to avoid conformity to changes in their institutional environment.

In academe, we deal with multiple resource dependencies. At the same time, we see that 'strong research units' need to comply with some aspects of their institutional environment to ensure future stability if needed. In this way, they try to reduce uncertainty in their environment even further. Thus, we have found that the strategies that are employed are not necessarily mutually exclusive. Strategic responses are more a matter of degree and likelihood of success than a matter of either/or.

NOTES

[1] We acknowledge the support for this study from the German Research Foundation (DFG) for the project 'Comparative Study on Management and Self-governance Models' from 2003–2006. We also acknowledge the further support of the DFG during 2006–2009 for a second stage of the overall project. This allowed us to revisit the countries and research groups under investigation in this paper.

[2] One might argue that biotechnology is a very old field (agriculture). The selective breeding of plants and animals has been carried out for a long time. However, with the 'global introduction' of molecular biology, a new age has arrived. In this memo, we mean 'modern' biotechnology.

[3] Biotechnology is defined in various ways. The term was coined as early as 1919 by a Hungarian engineer Karl Ereky and has been developing with the rapid advances in the field. The most encompassing definition is probably formulated by the UN 'Convention on Biological Diversity': 'Biotechnology is any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use. See http://www.wordiq.com/definition/Biotechnology

[4] See http://www.bbsrc.ac.uk/organisation/spending/analysis.aspx

[5] BioPartner was an entrepreneurship promotion programme established in 2000 by the Ministry of Economic Affairs (currently the Ministry of Economy, Agriculture and Innovation) and ran until 2004. Its objective was to contribute to the entrepreneurial culture of the Dutch academy and help to create 75 life-sciences companies. As a result, 109 life sciences companies and six incubators were established and in many cases were linked to the universities (Leisyte, 2010).

[6] Technology Foundation (STW) was established in 1981 by the Ministry of Economic Affairs (Van der Most, 2009). Currently, it is funded by the Ministry of Economic Affairs, Agriculture and Innovation, the Ministry of Education, Culture and Science and by NWO. STW's funding schemes are geared towards the utility potential of the proposals as can be seen in their research programme descriptions.

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