

Chapter 4

The Position of Technical Universities Within Changing Frameworks of Institutional Organisation and Steering: The Case of the Norwegian University of Science and Technology



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4.1 Introduction

In Norway, the Norwegian University of Science and Technology (NTNU) is regarded as the preeminent technological university. Originally, it was an independent and apparently distinguished elite institution – the Norwegian Institute of Technology (NTH) – with few students and high admission requirements. This institution’s primary task was to educate engineers (*sivilingeniør*), a profession historically the most important – and still important – supplier of Norwegian industry and industry leaders.

Within the framework of the massification of higher education, the institution’s status and autonomy have been challenged by changing state governance and social conditions. The period from 1980 onwards has also been characterised by high demand for subjects other than the technological.

Today’s NTNU is the product of several mergers and cooperation with other institutions, most recently with three state colleges, which means that NTNU appears as a hybrid of the traditional university of technology offering professional education, a university offering humanities and social sciences, a vocational college with lower-level professional education, and multiple research-intensive environments. Nevertheless, NTNU has managed to sustain its image as Norway’s leading technological university. As part of its mandate NTNU also plays a key role in innovation, led by a pro-rector for innovation.

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This chapter establishes a sociological-historical perspective and concepts to highlight dimensions that are important for NTNU to reproduce its status under changing governance regimes – for example, in the form of closure mechanisms and close links to specific groups in the social class structure. NTNU is understood as part of an academic field (Bourdieu 1988) with unequal strengths and distribution of power between subjects and actors – which has an impact on how state governance and other external issues are interpreted and translated into the NTNU organisation.

In the Norwegian context, the role of the state as the owner and overall governor of this almost hegemonic position of NTNU and similar institutions is extremely important. Systematic governmental efforts on technology over time exemplify how the state's role as a protector provides scope for NTNU to develop a distinctive field logic and organisational identity, which contribute to the legitimisation of internal strategies and resource allocations where technological subjects are prioritised higher than at the other Norwegian universities.

However, we are not going to resort to a one-dimensional structuralist/institutional approach in our analysis of NTNU's development, but rather seek a more balanced actor/structure approach. Through empirical examples we illustrate how the characteristics of institutional leadership – their social identity – affect the content and outcomes of institutional strategy processes, for example, in the merger process towards the “new NTNU”. It is argued that NTNU's choice of management model, principal and external chair of the university board symbolises dominant positions in the field as well as legitimises institutional strategies both internally and in relation to the significant external relationships.

The article is largely based on previous empirical studies of NTNU in connection with an analysis of national STEM initiatives (Langfeldt et al. 2014) and the follow-up research of the NTNU merger (Vabø et al. 2016).

4.2 Historical and Social Dimensions of the NTNU

As we learn in this volume, most Nordic countries have distinctive research-intensive universities with an emphasis on technology, such as the KTH Royal Institute of Technology in Sweden and NTNU in Norway. Finland and Denmark have also placed great emphasis on creating powerful environments through the merger of several institutions, such as the Aalto University of Finland with its emphasis on technology, natural sciences, architecture/design and economics/management.

The Norwegian University of Science and Technology (NTNU), established in 1996, originated from NTH – the Norwegian Institute of Technology, itself established in 1910. It is a ‘new’ university resulting from a merger between the Norwegian Institute of Technology (NTH), the Norwegian College of General Sciences (AVH), the Science Museum, and the Medical School in Trondheim. Together these units made up what was previously called the University of Trondheim (UNIT). UNIT, however, was more of an umbrella construction than an academically integrated university. Among other things, both NTH and AVH had their own rector before the merger (Stensaker 2004).

NTNU's oldest academic discipline – mineral resources engineering – can trace its roots to the foundation of the Royal Norwegian Geological Seminary opened in Kongsberg in 1757. The Norwegian Storting (Parliament) passed a resolution supporting the establishment of the Norwegian Institute of Technology in Trondheim and the decision was finalised on 31 May 1900.

Trondhjem Technical Vocational School (TTL) opened its doors as Norway's first technical college in 1870. Until it closed in 1916, TTL was widely seen as the country's leading institution for technical education. The vocational school was also the forerunner to Trondheim's two biggest educational institutions, the Sør-Trøndelag University College (HiST) and NTNU.

Hence, as the result of successive mergers, NTNU now covers not only most fields of science, but the humanities, social science, medicine, law and so on. Nonetheless, NTNU maintains its status as the premier technical university in Norway. Today, NTNU – measured by the number of students, employees and several other indicators – is Norway's largest university, with more subjects beyond the technological. In comparison with the other comprehensive universities, such as the University of Oslo, Bergen and Tromsø, at NTNU the disciplines of science, technology, engineering and mathematics – the STEM disciplines – remain dominant, and represent a much larger share of the total budget, students and staff. As revealed in Table 4.1, the R&D expenditure within science and technology in general and technology in particular is much higher at NTNU in comparison with the other comprehensive universities.

Technological subjects are primarily organised under the Faculty of Engineering and the Faculty of Information Technology and Electronic Engineering respectively. There are separate faculties of Humanities, Education, Economics and Management, Medicine and Health Science, and Natural Science. In addition to campuses and departments in Trondheim, Norway's third largest city, NTNU also has departments in the cities of Gjøvik and Ålesund, where the merged state colleges were located. The departments in Gjøvik and Ålesund are organised under the respective faculties.

NTNU is characterised by its preeminent engineering education and research excellence especially in the technological disciplines. Why this status is so strong despite there being more subjects and institutions included under the NTNU umbrella can be understood in the light of some of the historical and sociological dimensions of NTNU's position in society and in the academic field.

Table 4.1 Current R&D expenditure within natural sciences, engineering and technology at NTNU and the comprehensive universities in Bergen, Oslo and Tromsø 2017. Mill. NOK. (NIFU: FoU statistikk)

Institution	NAT	TECH	Total
Norwegian University of Science and Technology	426	1663	2089
University of Oslo	1128	262	1390
University of Bergen	901		901
The Arctic University of Norway	458	152	610

Norwegian higher education is shaped within the context of a young nation, with its oldest university established in the capital Oslo in 1811. Norway is a small country (approx. five million inhabitants) with (since the 1970s) an oil-producing economy. Norway has had good conditions to achieve its welfare state policy objectives in a social democratic regime placing great emphasis on higher education as a strategy to reduce social inequality (Ahola et al. 2014). The expansion of higher education in the 1960s and 1970s was marked by the social democratic era, where both social and geographical equality of education was normative for central policies concerning the number of students, the number of institutions as well as their geographical location, and a high level of institutional standardisation.

A strong focus on equal rights to higher education is illustrated both by the absence of tuition fees and through the limited emphasis on developing elite institutions (Bottomore 1993). NTH's role as an elite institution, rather than indicating a conscious awareness of the elite, is as we argue as much a result of Norwegian pragmatism – a strong scepticism towards investing in expertise – which resulted in weak growth in higher education, not meeting the actual demands (Forland 1996). This explains why Norwegian students, especially from the 1950s to beyond the 1990s, typically went abroad to study for engineering, medicine and other professional education. In many ways, this is a paradox also considering the then burgeoning national oil economy.

For several decades, NTH had a national monopoly in educating engineers. It admitted few students, hence operating with high admission criteria. NTH was able to maintain its status by such restrictive mechanisms (Murphy 1988) as rigorous criteria of admission in general, and particular emphasis on the qualifications of applicants within mathematics and physics. Civil engineers – especially from NTNU, are still highly appreciated in the Norwegian workplace, and NTNU recruits high-achieving students from upper secondary school.

Furthermore, there are distinct patterns of recruitment characterised by a high proportion from the middle class – as well as a significant degree of self-reproduction, statistically speaking: a high incidence of sons and daughters of engineers (Høstaker 1997). This is, we argue, a robust indicator of the ability of NTNU to maintain its status – as the social background of students can serve as empirical evidence of social and intellectual patterns of valuation of types of higher education in society.

The position of NTNU has also been supported through its close ties and cooperation with the largest Norwegian (and largest Scandinavian) technical industrial research institute – SINTEF, which was established by NTH in 1950 (its original full name was 'Selskapet for industriell og teknisk forskning ved Norges tekniske høgskole') and located in Trondheim (Borlaug et al. 2015). While SINTEF now also has close collaboration with the University of Oslo and offices at multiple locations in Norway and abroad, it remains a very significant part of NTNU's institutional environment. SINTEF represents vital scientific capital as a research collaboration partner, and as a recruitment and cultivation centre in a fluid exchange of students and academic staff.

4.3 Organisational Identity

The concept of organisational identity refers to the symbolic, mythological and cognitive sides of an organisation. Furthermore, an organisational identity is an important framework from which an organisational reality can be constructed (Stensaker 2004).

NTNU's organisational identity is first and foremost reflected in its name, and a result of the particular mandate given to it by the Ministry of Education and Research. There are further examples of how this identity is symbolised, as in this quote taken from the NTNU institutional strategy 1998–2010: 'Through leading academic environments, NTNU will secure and renew the nation's technological competence. NTNU has a technical-natural science profile and main responsibility for education and research in technology in Norway. 2010–2020: Our technical and scientific main profile gives us a special assignment to develop the technological foundation for future society.'

This does not mean that we fall into a one-dimensional understanding of organisational identity. As within most comprehensive universities, the academic discipline is usually the most important point of identification for academic staff (Henkel 2000). It may be difficult, not least at comprehensive universities, to clarify distinctive aspects of identity at the institutional level. As was also apparent within the framework of the most recent merger process at NTNU, investigations of possible new internal organisational structures were characterised by tensions between the professional education milieu and the members of disciplinary based departments and faculties (Vabø et al. 2016).¹

NTNU's identity and national status over time are maintained partly through such symbolic characteristics and through recruitment patterns among students and academic staff. Inevitably such characteristics will affect the self-understanding among the academic staff – in particular those who are members of technological disciplines and fields.

As we shall return to below, this organisational identity is both directly and indirectly reinforced by externally-induced policies such as national policy priorities of the STEM disciplines as well as management policies that allow additional priorities of technological subjects through internal strategies.

4.4 The State as a Protector

While elite institutions, as we know them from most western countries, are relatively autonomous, NTNU is subject to state ownership and governance. Public policies and financial priorities for higher education and research, and the relevance

¹ <https://www.ntnu.no/documents/1262755726/1264426837/Arbeidsgruppe+for+disiplinlag.pdf/7272262a-9760-4868-8f96-3e3ab505942d>

of different parts of the academic field – in this case the technological disciplines and engineering – are therefore significant empirical aspects of governance and strategy that can explain NTNU's ability to reproduce its status as a technological university.

Norway has a well-established consensus for prioritising research and education in the areas of natural sciences, technology, engineering, and mathematics. Special policy priority at the national level – from the state and a range of stakeholders, such as the National Federation of Enterprises (NHO), has been given to the technical disciplines. These policies should be understood in relation to the idea, or myth, of technical disciplines as being of greater general importance for society than other academic disciplines.

One type of measure is the establishment of national centres for the enhancement of mathematics education (2002), and a centre working to increase recruitment to the sciences (1998) – typically located at the NTNU campus. Another type of measure is the inclusion of STEM research as a steering indicator in the Ministry's governance of universities and university colleges. The rationale for strengthening these subjects is partly based on identified weaknesses, such as gradual decrease since the 1970s in the national level of knowledge in mathematics among students. This is also revealed as low performance among Norwegian students in international tests in mathematics and science, insufficient recruitment to graduate studies in science and technology as well as a relative decrease in the share of R&D expenditure devoted to science and technology. It is widely recognised that research and education in science and technology is crucial for the ability to address societal challenges. The first national STEM action plan was issued in 2002. Since then, policy expectations of strengthening STEM subjects have been expressed in various contexts and included in a number of policy processes.

Policy expectations to strengthen the STEM subjects have generally taken the form of "soft" policy directions rather than top-down instructions on internal budget allocations. One exception is the Ministry's allocation of strategic institutional funding, where funding of new students and PhDs in STEM disciplines, as well as for scientific equipment, has been systematically prioritised over recent years (Langfeldt et al. 2014).

Nevertheless, also in line with international trends, recruiting the most able students to the elite technological subjects and disciplines has not always been the easiest task, as these study programmes face competition from other popular areas of study, such as business administration, aesthetic subjects, or biology and medicine.

Also for other reasons, including demographics, there have been limitations to the realisation of national policies for enhancement of STEM disciplines. There are well-known trends, such as a decreasing number of students with the necessary admission qualifications, e.g. an adequate basic level in mathematics. According to the admission criteria of NTNU there are simply not enough able students in the potential pool of recruitment. Hence, despite its high general admission criteria, and despite its popularity in general, today NTNU has to offer special preparatory courses etc. in mathematics. Furthermore, there are in general difficulties in attracting female students as they might prefer other types of STEM subjects rather than

civil-engineering oriented study tracks. There is also competition from other fields, not least from the aesthetic turn in the 1980s, where humanities began to recruit more students, also in such subjects as media and film. Nevertheless, as we turn to below, national policies for the enhancement of STEM disciplines (and particularly the technological subjects) have provided a legitimate frame for institutional strategies favouring these academic subjects.

4.5 On Constructing an Organisational Field

As a result of increasing global competition and international cooperation, the development of NTNU as an institution is no longer perceived as part of a nation-building project. It is to a greater extent characterised by international standardisation, for example, in degree structure and more pronounced competition along selected indicators important for scientific and other forms of reputation.

Nevertheless, as in other Nordic welfare state countries, contrasted with many European countries, which have more privatisation of technical universities, Norway's public universities are to a large extent protected by the state. The state is the main source of finance. Due to these funding criteria and other market regulating mechanisms, such as number of students, this makes institutions such as NTNU less sensitive to cyclical shifts in the market than most probably would have been the case in technical universities that are players and compete between many technical universities in the private sector economy (e.g. Portugal, Poland). The strong state integration is an important backdrop for NTNU's ability to reproduce and strengthen its status over time.

NTNU has its formal governance structure as enshrined in law, and other principles of organisation in Norwegian higher education. But, we shall not neglect that internal decision-making processes, as they seem to be rational, will be characterised by power relations in the academic field nationally and locally (Flyvbjerg 2012).

As government agencies, Norwegian universities and colleges are primarily subject to the allocations and budget guidelines emanating from the Ministry of Education and Research. At the same time, the government aims to govern at an overall level, leaving much of the professional management to the institutions themselves. This has been based on concerns of academic and institutional autonomy and the sector's heterogeneity. The funding system for universities and colleges currently consists of long-term and strategic allocations and performance-based funding, where the – rather minor – performance-based part depends on the results achieved in education and research respectively. Mechanisms in the system have been relatively similar over several years. From 2012, the Ministry introduced a more general incentive structure (Ministry of Education, Prop. 1 S (2011–2012)). A key point of these changes has been that the institutions' goals and strategies should be followed up on the basis of the entire budget framework allocated to them. Basically, therefore, the institutions have the flexibility to make their own budget priorities. They can follow the ministry's emphasis on STEM subjects in a variety

of ways, through direct and more indirect instruments, such as granting fellowships/postdoctoral studentships, support for application work in STEM subjects, support for projects that have received (attractive) external funding such as ERC grants, support for infrastructure, equipment, construction, support for measures to stimulate cooperation with other external research communities as well as development and strengthening of teaching in STEM subjects. These are examples of priorities that may be important institutional measures to strengthen research in the STEM subjects, and to make STEM subjects attractive for students and employees.

4.6 Top of Form

The budget process is usually characterised by many different and partly contradictory targets involving a more or less permanent competition between subjects to win forward with their legitimate needs. Our question, however, in this case concerns NTNU's ability to prioritise one thing over another, and the meaning that national guidelines may have for such priorities.

The question of how incentives work depends here on the degree to which the institutions have the room and the will for such cross-subsidy between fields. NTNU has had more differentiated (internal) rates for its various study programmes and subjects. This can be illustrated by NTNU's own assessment, which states that "*When it comes to division between faculties, NTNU has a distribution model that gives technology communities good results compared to the humanities and social science environments.*" (Langfeldt et al. 2014: 77). The distribution models have many different elements, and the most important differences between the NTNU model and the Ministry model are NTNU's finer calculation of rates for different types of education. This means that it is not the individual department which has to absorb extra costs for most field and laboratory class teaching. Here it is worth noting that NTNU is one of the universities which has had the greatest growth in permanent scientific staff in STEM subjects, indicating the will and ability to allocate funding for STEM subjects (Langfeldt et al. 2014: 51).

This case is yet another example of how organisational fields are constructed as part of the interest of certain professions, disciplines, fields of science etc., as well as to how organisational identity characterises institutional strategies – and their outcome.

Against DiMaggio's (1991) perspective we might also understand why in the oldest comprehensive universities, the universities of Oslo and Bergen (UiO and UiB), the strength between various fields of science is more balanced than at NTNU. It is more difficult for these universities to justify internally that some subjects, in this case STEM subjects, are more important than others, especially in periods where other subjects experience more growth in student numbers than the STEM subjects, as has been the case periodically. By contrast, the management of institutions with a heavy emphasis on STEM can facilitate the legitimacy of changes in favour of these subjects.

As we will turn to below, NTNU is also characterised by a management model with appointed leadership, which gives more legitimacy to implement the strategies that benefit the STEM subjects. In comparison, the UiO is more fragmented and has less ability to implement strategic choices. The implementation of strategically prioritised focus areas through redistribution of funds internally – i.e. taking from one subject area and giving to another – necessarily attracts resistance and protest, not just internally, but also externally, from the groups of stakeholders that are attached to the subject in the form of candidates, contractors and users.

Such institutional dynamics are no less interesting considering the ongoing debate in the Nordic region about the need for increased institutional autonomy from government management as part of increasing the institutions' strategic management capacity (Hedmo and Jernberg 2017). Formally, a number of governance reforms have taken place towards more institutional autonomy in the last two decades in all the Nordic countries. Academic and administrative leaders have gained a clearer and stronger position. The increasing use of *appointed* leaders, with effective decision-making and strategic priorities, is believed to counterbalance a potential struggle of interests between different disciplines and interest groups. Accordingly, the boards at all levels have fewer members. Academic staff have fewer representatives, and there has been greater emphasis on external representatives. By this, the institution is supposed to bring in other competence through board members than the institution itself possesses, be it professional competence, networking, supply of ideas and legitimacy, or the interests of the various external stakeholder groups. Considerations of openness and democratic transparency are also an argument for the use of such boards in the public sector. The current comprehensive Universities and Colleges Act provides clear guidelines for the organisation and composition of boards at the institutional level, but it is open to significant institutional autonomy when it comes to questions about the use of elected or appointed leadership at the various levels, or the extent to which one should use boards or advisory groups at faculty and departmental level.

According to research from Norwegian higher education, however, the choice of governance model has little significance for strategic decision making at institutional level within the framework of strong state ownership (Frølich et al. 2018). However, we argue that we should not resort to rigid institutionalism – nor to a one-dimensional structural approach. Irrespective of choice of governance model, we argue that institutional policies are decisive for maintaining status as the number one technical university and should be understood in light of the background and social identities of leading actors in decision making processes: the head of the board, the collegial bodies, as well as the academic staff members of the technical disciplines.

NTNU's rector (in the period this chapter is focused on: 2013–2019) is a professor of medicine, Gunnar Bovim. His professional and academic background represents a departure from previous practice at NTH, where the principals have typically represented the classical domains – and important building blocks – of engineering education. In one period during the 1960s, the NTH rector was a statistician; and in a two-year period in the 1970s, the rector was a social economist. Since NTNU's

creation in 1996, the three rectors preceding Bovim had backgrounds in mathematics (E. Spjøtvoll), and physics (E. Hiis Hauge and T. Digernes) (NTNU 2018).

While the choice of a medical scientist as principal represents a departure from earlier traditions, it is still typical of trends in the Western world, where rectors at research-intensive universities often represent medicine or natural science or technological subjects/professions (Goodall 2006). We have the impression, although no systematic empirical evidence, that strong alliances between academic milieus and leadership within technology and life sciences are typical of the ongoing development of Europe's major universities taking place within the framework of structural reforms and extensive mergers.

The strong position of NTNU as the leading technical university also manifests itself in the use of an appointed external leader of the university board. The current (2019) leader of the board, Svein Brandzegg, is not only the top executive manager in one of the most significant industrial companies in Norway (*Norsk Hydro*), he is also educated as a civil engineer and holds a PhD in chemistry from NTNU. The local institutional leadership we understand as part of enlarged policy communities (Sabatier 1991) involved in identifying issues and alternative solutions. As chairman, Brandzegg is also important in legitimising key policies, towards the dominant professional coalitions and external stakeholders. Brandzegg symbolises in this respect not only the masculinised technological scientific order – he is also at the same time the industry's representative in Academia.

In the following analysis of the latest NTNU mergers, we will argue that these local institutional positions and power relations, in conjunction with national political conditions, were decisive for the shaping of the merger as a strategy to strengthening NTNU's position as a technical university.

4.7 Mergers as a Catalyst for Boundary Negotiations

As argued in Chap. 1 in this volume, the idea of a technical university typically evolves in response to changes in structure and dimensioning of national higher education systems – or changes in governance of higher education.

In the case of Norway, the NTH monopoly was gradually reduced during the 1980s when some universities and state colleges were given the right to grant engineering degrees (Forland 1996).

In the early 1990s, the status and autonomy of NTH were changed due to policies aimed at changing the steering conditions of the higher education sector. The rapid growth of higher education in the 1960s, '70s and '80s, combined with the upgrading of vocational schools to institutions of higher education, led to a substantially increased number of higher education institutions. A national committee appointed by the government to propose future policies suggested that extensive mergers and other efforts to concentrate resources were needed in a sector characterised by fragmentation and poor utilisation of resources, both economic and academic (NOU 1988:28).

At this time, the NTH represented a highly autonomous unit within the University of Trondheim, UNIT, which in addition consisted of the AVH, a museum and a section for medicine. NTH was governed by its own academic collegium, which implied that professors in technology represented the majority of the academic senate of NTH. The suggestion to develop this into an integrated university (NTNU) threatened the independent status of NTH (Brandt and Nordal 2010).

The launch of such initiatives by the then Minister of Education, Research and Church Affairs in the Labour party government, sociology professor Gudmund Hernes, caused debates in the national press and central political decision making bodies, such as in the Storting.

The idea of NTNU was criticised for not living up to the standards of a classical comprehensive university, in that the technological subjects represented the majority. It was argued that technical specialisation would exist at the expense of academic pluralism. Given many contextual factors, such as the general growth in higher education, competition from other study segments and the fact that NTH no longer had the national monopoly in educating civil engineers, it was, however, not easy to argue for maintaining the institutional autonomy of NTH (Brandt and Nordal 2010).

Since the 1980s, the overall structure of the Norwegian higher education has gradually switched from a binary system to an integrated system where one easily can combine studies from the state colleges with university-based courses and degrees. In recent years several state colleges have been upgraded to university status, and as a result of mergers many former colleges have been incorporated into universities (Elken and Frølich 2017). These and other developments are part of the backdrop that the then government and Minister of Higher Education and Research referred to in their White Paper released in January 2017. It proposed a series of reforms that could be interpreted as an expression of finding a new formula for clearer differentiation between mass and elite studies in Norwegian higher education, aiming for more distinct quality differences between study programmes, for instance, through the establishment of research-oriented programmes, and an academic positional hierarchy marked by a clearer division between research and a teaching-oriented career track (Vabø 2017).

Turning to the more recent stage in NTNU's institutional history, we find another kind of merger process. In January 2016, NTNU merged with the three University Colleges of Gjøvik, Ålesund and Sør-Trøndelag, with the result that NTNU is currently Norway's largest university.

The institutions' decision to merge took place against the background of key political ambitions to reorganise the structure of the Norwegian higher education system, with an aim to increase the quality and efficiency of education and research. Achieving higher quality of education and research has also been a key ambition for the four institutions in this particular merger process.

In 2015, the parliament suggested that 14 institutions merge into five, of which the new NTNU is one. Central authorities suggested that the existing structure was not adequate to improve quality in higher education and research, but that mergers would provide a better basis for improving both academic and administrative

capacity. The existing institutional structure in Norwegian higher education, it was argued, was characterised by challenges as a result of the existence of many small academic communities, geographically dispersed and fragmented. It was argued that the academic communities were characterised by too-low quality in their core activities – research and education. Some institutions attracted few students and researchers published too little. These institutions are regarded to be ineffective and they attract too little external funding. Too many small institutions are considered to be unsuitable also in terms of future development, in terms of demographic development, social knowledge needs and an increasing degree of international competition in higher education and research.

Prior to the mergers, it was expected by the Ministry that the institutions would be proactive in terms of with whom they should cooperate. Here the NTNU top management was in the early stages and was able to get into agreements of intent with state colleges that particularly emphasised areas that could supplement NTNU's technological subjects: Gjøvik with its ICT research, and Ålesund with its maritime technological research. In line with DiMaggio's (1991) point about how organisational fields are constructed as part of the interests of professions and field of practice, this NTNU case is yet another example of how organisational identity characterises institutional strategies – and their outcome.

The official arguments in the merger process and the decision-making and budget allocation processes internally at NTNU, in which NTNU planned the merger process with other institutions, were definitely in line with the central authorities' objectives of the Structural Reform. Thus, following Flyvbjerg (2012), behind the apparently rational narratives alternative explanations and perspectives can be identified. The Structural Reform also represented a window of opportunity: a policy stream (Kingdon 1984) which helped the policy entrepreneurs of NTNU's top leadership to colonise and control parts of an academic field that were relevant for NTNU as a technological university. The state colleges in Gjøvik and Ålesund were interesting both as outstanding research environments in ICT and in relation to practical maritime technology. Alternatively, NTNU could end up with a less strong base in the new institutional landscape that is under development in higher education nationally and internationally.

The last three decades have been characterised by further developments of great importance for the organisation of higher education. Students taking more higher education, more systematic political commitment to research and innovation, and increased global competition for the most talented researchers, are among the trends that have helped to justify recent comprehensive structural reforms. As mentioned above, NTNU is currently in a post-merger phase in the process of integrating three state colleges in its organisational structures.

This recent merger caused a reaction among the academic staff in the technical disciplines at NTNU and their union, the Norwegian Society of Graduate Technical and Scientific Professionals (Tekna), as they feared the merger would diminish their status – “market brand” – and working conditions in favour of academic staff at the former colleges (Vabø et al. 2016).

Like most other merger processes, the process towards “the new NTNU” has partly been met with much resistance, not least among the academic staff at the old NTNU. Subject to limited representativeness (N 447), Tekna’s survey among its union members at the four educational establishments showed that 65% were in whole or in part against the merger, especially at NTNU (Vabø et al. 2016, p. 25).

As elaborated in Chap. 2 of this volume, in common with many universities, lower-level engineering is taught in polytechnics or universities of applied sciences/university colleges, with the higher levels in the technical and/or comprehensive universities (or both). This model is based on the idea of a division of labour in tertiary systems of higher education. However, by merging state colleges and universities this idea has become challenged. The resistance to the merger in the established technology environments of the old NTNU is, from that perspective, as expected.

4.8 Conclusions

NTH, the original renowned technical higher education institution in Norway, long had a national monopoly in educating civil engineers. The fact that NTH also operated with limited student numbers, high admission requirements, and student recruitment patterns with distinct traces of self-reproduction, indicates that this institution’s position clearly reflected classical perspectives on professional and elite institutions.

In comparison with its Nordic neighbours, Norway has invested less in technological research. Nevertheless, state ownership in higher education may be important in maintaining NTNU and its technology teams’ high degree of social and scientific standing – both as a protector against adverse cyclical fluctuations in the student market, and through specific national initiatives and financial and other measures to strengthen these subjects.

High rankings in a social and intellectual hierarchy have also highlighted the internal dynamics in such a way that study places in technological subjects are valued higher than other subjects in the internal resource allocation formula. Here NTNU distinguishes itself from other Norwegian comprehensive universities which, for reasons of internal legitimacy and balance, do not make use of this budgetary scope. In line with DiMaggio (1991), among others, we understand the resource allocation dynamics at NTNU as institutionalised practices that help maintain boundaries – boundaries between the technological and other subjects.

Gradual loss of monopoly over civil engineering education, and the expectations of central authorities to collaborate with other higher education institutions, have over time contributed to this technological institution – not unlike developments in some other countries –gaining a more hybrid character. Status as the foremost technological university, rather than as a comprehensive university, has nevertheless been an important part of the organisational identity of NTNU – even if it is still challenged.

For NTH, and subsequently for NTNU, mergers have been characterised by boundary negotiations, such as regarding the reorganisation of subjects and disciplines, position structure and career dynamics for scientific staff coming from different subjects and institutions. The institutional transformation processes that followed in the wake of the former NTH's mergers with other institutions clearly reflect such organisational theoretical concepts as organisational identity and boundary negotiation.

However, the analyses in this chapter also argue that the merger processes can be understood as a policy stream, where local leadership includes an alliance between the principal – a professor of medicine – and the chairman, one of Norway's best known business leaders, who holds a PhD from NTNU. Together they have taken the opportunity to colonise key technological research environments and practice fields in the former college sector.

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