The research presented in this book provides analytical frameworks and case studies on engineering practices in education and professional work. The studies are inspired by practice theory as well as science and technology studies. The contributions demonstrate how these practices mutually dependent in co-construction processes in different domains of engineering. In order to demonstrate these essentially dynamic features, the empirical material is aimed at unravelling the interrelatedness of educational and work practices in engineering and analysing them as inherently situated in order to understand how engineering professionalism is produced. The studies are motivated by the following questions:

- How can we understand different engineering practices and how do they relate?
- Which dimensions facilitate transitions between educational practices and work practices?
- Where is engineering professionalism learned and the engineering ‘mindset’ constituted?
- How does engineering professionalism change in response to societal challenges?

The studies focus on the responses to societal challenges in education and professional work settings. The outcomes show how engineering has responded to challenges concerning environment, energy, sustainability, design, user interactions, community engagement and entrepreneurship. This has been done through the identification of codes of meaning and the institutions that frame the translation from challenges to professional responses. How these responses are performed within engineering professionalism is crucial for the societal role of engineering.

The concluding chapter synthesizes the answers to these questions and the lessons learned from attempts to develop engineering in the different settings studied. It highlights the linkages among them, drawing on findings and details from the individual chapters as well as the literature in which they are situated, showing how the different sites interact and produce specific representations and frameworks central to engineering professionalism.
Engineering Professionalism
PROFESSIONAL PRACTICE AND EDUCATION:
A Diversity of Voices

Volume 2

Series Editor

Allan Pitman
University of Western Ontario, Canada

Scope

Professional Practice and Education aims to provide a forum for perspectives of our understanding of the nature of professional practice and the consequences flowing for education in the professions. It is the intention of the Editor that a platform will be provided for contributors from diverse cultural backgrounds, so that, on a global level, the nature of professions and their cultural/historical positioning might be problematised and re-examined.
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1. INTRODUCTION

The Practice Turn in Studies of Engineering Work and Education

INTRODUCTION

The research and discussions presented in this book provide analytical frameworks and case studies on how institutional and practical settings in engineering education and professional work are entangled and mutually dependent in co-shaping or co-construction processes within different domains of engineering. In order to demonstrate these essentially dynamic features, the empirical material is aimed at unravelling the interrelatedness of educational and work practices in engineering and analysing them as inherently situated in order to understand how engineering professionalism is produced.

The view of a certain linearity whereby education has to prepare students to fulfil professional job requirements orients educational planning towards producing the competences needed and articulated by employers. This view draws on a metaphorical reference to supply and demand which is questioned from the outset of this analysis. Educational settings may produce knowledge and skills that complement or sometimes only partially provide the competences required in many job situations. At the same time, professional practices and routines may ultimately restrict the visions and competences developed in the educational setting.

The perceived ‘gap’ between education and work is therefore questioned, and the contributions herein demonstrate that such a perspective neither supports the development of new perspectives through what is often termed ‘engineering educational reform’ nor provides an accurate account of how learning, innovation and new job practices relate and emerge. The approach taken in this book is to engage in studies of practices as they develop in co-existing sites of education, work and professional discourse as well as on different scales, and to open avenues for understanding how they contribute to dynamics in the production of engineering professionalism.

AIM OF THE BOOK

Although the aim is to demonstrate the inter-linkages, the thematic structure of the book follows the institutionally well-established divide between education and professional work. While the individual chapters take either the education
or work context as a starting point, the analyses reveal many crosscutting issues that demonstrate the complex relationship between education- and work-related practices. This provides a basis for addressing conclusions directed towards the different sites and their roles in shaping the performed practices.

Studies of engineering in these different but inter-related settings are motivated by the following questions:

- How can we understand different engineering practices and how do they relate?
- Which dimensions facilitate transitions between educational practices and work practices?
- Where is engineering professionalism learned and the engineering ‘mindset’ constituted?
- How does engineering professionalism change in response to societal challenges?

In this book, the term professionalism refers to what we have introduced as professional practices – activities related to the work and study of engineering analysed through the perspective of the ‘doings and sayings’ of engineering professionals. The relationship of engineering to other professions and its societal status (a topic that is often explored in studies of engineering as a profession) is not a primary focus in this book, even though it is included in examinations of the practices of engineering institutions and their framings of engineering.

The concluding chapter synthesizes the answers to these questions and the lessons learned from attempts to develop engineering in the different settings studied. It highlights the linkages among them, drawing on findings and details from the individual chapters as well as the literatures in which they are situated, showing how the different sites interact and produce specific representations and frameworks central to engineering professionalism.

WHY THE FOCUS ON PRACTICES?

Throughout more than a century scholars have explored the field’s contributions to technological and societal change, and the role of engineering education. Scholars have examined engineering achievements based on personal accounts, professional identities using a sociological approach, the role of engineering in specific forms of government based on political science, and the role of engineering in innovation based on historic accounts. Moreover, scholars have focused on ethical and political dilemmas of engineering vis-a-vis societal impacts of technological change and the very nature of engineering based on speculative and philosophical reflections (for an overview see e.g., Jørgensen, 2010) These varied accounts have produced images of engineering that tend to be quite idealized and even stylized presentations of these professionals and their activities. The result has been accounts that to a large extent support popular images of engineers as heroes of innovation and progress, servants to industry, or technocrats with limited insights into social matters. While such studies
have shed light on certain institutional and professional aspects of engineering, they have provided less insight into how engineering is performed in different sites.

Critique of these hitherto dominant accounts has sparked increased interest in opening the black box of how practitioners perform engineering. Studies from the 1980s and 1990s of engineering educational programs and professionals demonstrated that the knowledge and skills taught in engineering schools seldom came to be used in work situations as straightforward problem-solving tools. These studies were instrumental in pointing to a ‘gap’ between the knowledge that is taught and the knowledge in use, paving the way for a model of the relationship between education and work that frames these sites as separate, with their own rationales (Jakobsen & Jørgensen, 1984). One productive outcome of these studies was a discussion about the translation versus the transfer of knowledge, which led to pedagogical and didactic reforms, including attempts to make project- and problem-based learning core to engineering, and to incorporate more complex and authentic problems in curricula. These new perspectives paved the way for an increased interest in better understanding ‘what engineers do’ that led to a new focus on engineering practices (Downey, 2005; Kolmos et al., 2007).

It also resulted in a renewed interest in the study of engineering practices with an emphasis on the role of practical vocational knowledge as well as the importance of other forms of knowledge pertaining to real life engineering challenges. Thus, scholars began to study the practices involved in performing engineering as a multifaceted professional task (NAE, 2005; Jørgensen, 2007; Grasso & Burkins, 2010).

THE PRACTICE TURN IN ENGINEERING STUDIES

This interest in engineering practices has emerged in several publications in recent decades. The body of literature constituting the new approach to studying and understanding engineering includes a number of studies that seriously consider the role of technical design concepts, practical experimentation, and the challenge of scaling. An example of this is Vincenti’s (1990) book, *What Engineers Know and How They Know It*. Afterwards, scholars published studies of the role of drawings as an important part of engineering design and communication (Ferguson, 1994; Henderson, 1998), and the role of design dialogues and object worlds (Bucciarelli, 1994; Vinck, 2003). In another line of practice studies, scholars focused on other aspects of engineering related to the importance of engineers’ life worlds (Mellström, 1995) and the role of communities of practices in engineering and how engineering work organizations operate (Kunda, 2006; Barley, 2005; Barley & Kunda, 2004).

In a publication edited by Williams, Figueireda and Trevelyan (1994), the practice perspective was used as the core approach to study engineering work in line with our intentions for this book. The studies included here reveal the need to account for the realities of practice, including both the social and the technical aspects of engineering and their interaction.
We also include the new field of research called ‘Engineering Studies’, which is distinct from and builds on the fields of ‘Technology Studies’ and ‘Science Studies’ and contributes to the practice turn. In his article, ‘What is engineering studies for? Dominant practices and scalable scholarship’, Gary Downey (2009) provided an overview of some of the very basic and important findings that studies of engineering practices have contributed in recent decades.

The core of an engineer’s identity lies in the ability to solve problems by using mathematical tools. This is a dominant image, a taken-for-granted and non-discussed trait of the engineering profession (i.e., what engineers are able to do) and the most important pedagogical strategy (i.e., teaching engineering students how to solve problems in a very particular way through the use of mathematical tools). Many of the discussions on how to improve engineers’ professional capacities focus on additional requirements, not whether the core competency should be re-worked. Moreover, there is little discussion of how non-engineers are excluded from the definition of problems to be solved as well as how it disregards other disciplines that now claim jurisdiction over technological development, such as the sciences. Whereas practical training historically has been at the core of engineering education, the enormous expansion of engineering programs in poor countries has sparked a trend toward focusing only on the theoretical problem-solving aspect and abandoning laboratory training and practical skills development.

At the same time, Downey stated that engineering educators have begun looking beyond engineers for curricular help to an unprecedented extent to prepare engineers not only for local contexts, but also for global contexts, which is one of the main challenges currently faced by engineering educators. Downey also referred to scholarly work on how engineering includes myriad negotiations among forms of engineering knowledge, strategic activities of heterogeneous agents, specific territorial formations, monetary distributions, etc. This also applies to the idea of career path development and to engineering students’ actively involvement in constructing their identity as they struggle to adjust to the culture of problem solving within engineering.

THE PROCEED PROJECT AND ITS FINDINGS

Contributions to this book are the outcomes of collaborations among Danish, Nordic and American researchers brought together by a research project funded by the Danish Strategic Research Council. The question that motivated the research project ‘Program of Research on Opportunities and Challenges in Engineering Education in Denmark’ (PROCEED) was: How have important and pressing societal challenges influenced engineering education and the professional work of engineers? Research findings indicate that uptake processes are slow and often end up transforming the challenges. Based on these project findings, which were presented in a series of seminars, this book presents attempts to identify and discuss how current practices in engineering, institutional planning, education and work
can contribute to our understanding of how the engineering profession might be changing. The contributions presented in this book continue the discussion and present some of the findings resulting from specific studies of practices.

The PROCEED research project’s basic assumption was that engineering professionalism is produced and reproduced in different, but mutually constitutive institutional contexts: institutional settings concerned with the reproduction of engineering knowledge and skills (i.e., engineering education and research), and companies and professional organizations concerned with the application of engineering knowledge and skills in work practices.

Core elements of transformation within the engineering profession include the recent focus on environmental issues and increasing attention to the impacts of climate change and sustainability as well as the renewed emphasis on design skills in engineering. An outcome has been the creation of new design programs at engineering schools (e.g., Delft University in the Netherlands, Rensselaer Polytechnic Institute and Stanford University in the United States, as well as the Norwegian Technical University, the Technical University of Denmark and Aalborg University in Denmark). These educational institutions are responding to product development and innovation demands (e.g., a focus on user involvement and sustainability) from society and industry in the context of globalization and new cooperative initiatives. Scandinavian countries are known as the breeding ground for the participatory design approach that strives for fairness and user influence in design processes, including changes in organizational relationships, processes, etc., which is a primary reason why the PROCEED project originated there.

Another set of challenges to engineering education and practice can be found in the demand for innovation and business orientation – what in recent decades has been incorporated under the umbrella of ‘entrepreneurship’ across countries in response to the central role of innovation and new ways of applying techno-scientific results. Demand for more knowledge among engineers related to industry practices and the economic aspects of innovation (i.e., ‘the business case’) has existed for a long time. The new perspective that is included in the ‘entrepreneurship’ challenge asks engineers not only to understand economics and business organization, but also to adopt new ways of working with innovation and to bridge technical knowledge and applications in business and society (Jørgensen & Valderrama, 2012). These developments serve as the backdrop for this book.

BOOK CONTENT OUTLINE

The first three parts of the book focus on three of the sites constituting engineering professionalism: institutional policy, education, and work. All chapters build on empirical studies of practices that help shape engineering professionalism. The fourth part of the book synthesizes the findings from the first three parts.

In Part 1, which focuses on institutional practices, Atsushi Akera and Xiaofeng Tang contribute with two chapters. The first, Chapter 2, focuses on governmental
conceptions of engineering educational planning. The first is the workforce supply provision perspective of the 1950s and 1960s based on ideas of prediction and institutional positioning and the notion that society can provide the knowledge and specializations needed through institutional and disciplinary investments and planning efforts. The second, fostered in the 1980s, is rooted in a neoliberal market-based model where institutions are given more space to develop programs and the necessary research and innovation base.

In Chapter 3, they present an analysis of the strategic positioning of five Danish engineering schools (institutions) based on data from site visits and interviews. The analysis shows how institutions assign different weights to a multitude of strategies, resulting in different relationships among disciplinary priorities, engineering profiles, and priorities assigned to research and innovation. Reforming education and meeting societal challenges through new programs and disciplines are only two among many institutional concerns. The neoliberal concept of accreditation and the common framework resulting from the European Union’s Bologna process demonstrate the importance of branding and innovation strategies.

Part 2, which is about educational practices, includes Chapter 4, written by Andrés Valderrama, Søsser Brodersen and Ulrik Jørgensen. Their study combines a historic investigation into how existing codes of meaning constructed within established educational programs and research disciplines have shaped the uptake and translation of societal challenges in the fields of environmental protection and energy since the 1970s at the Technical University of Denmark (DTU) and at the newer Aalborg University (AAU). These translations have divided a societal crisis into known disciplinary contexts by transforming them into operational objects that fit existing engineering divisions of labour. The recent decade’s sustainability challenges have resulted in a renewed focus on climate change and resource scarcity that once again has raised questions about their uptake in engineering. The analysis demonstrates that modelling issues are constituted as new disciplines, while social interaction and change agendas are opposed by established disciplinary traditions.

In Chapter 5, Karen L. Tonsø explores how engineering identities were at play in efforts to re-incorporate design as an important part of engineering education at an engineering school in the United States during the 1990s. Her analysis shows that despite good intentions, the inertia of the engineering education culture spilled over into a design setting by framing the conditions of possibility. This setting thus did not simply balance out the identity formation dynamics that take place on campus. She shows these dynamics by tracing how members of a design group behaved in a collaborative project with a professional engineer when they actually went to the plant where the engineer worked and conducted a number of tests for their engineering design project. This illustrates how capstone projects confirm or challenge the identities engineering students form as they pursue their studies. Tonsø emphasises how instrumental, objectivistic, and abstract goal orientation fosters student identities that appear contradictory to the visions embedded in reform strategies for learning and cross-disciplinary integration.
In Chapter 6, Anne Katrine Kamstrup studies how the CDIO (Conceive, Design, Implement, Operate) framework was deployed at two institutions in Denmark: the Technical University of Denmark and the Aarhus University School of Engineering. Her main point is that administrators, engineering educators and students envisioned and enacted CDIO in different ways. Students did not embrace the CDIO structure, but regarded it as a ‘cute’ pedagogical pirouette that was less relevant than the dominant elements in education (e.g., exams and reports). The educators viewed it as a challenge to existing educational programs with the prescribed mix of project assignments and coursework, and did not fully implement it as disciplinary norms and testing practices prevailed.

Nathan Canney’s study in Chapter 7 is rich in detail about the motivation of four students to join new service learning initiatives in local communities and pursue careers in that direction. He emphasises the disconnect between students’ aspirations and the professional advice given to them. The result is that only one of the four students actually dedicated her career to working on development projects, while two others ended up in typical engineering jobs ‘to gain experience’ and the fourth left engineering altogether. Canney illustrates how engineering students are provided with opportunities to engage in development projects, but that these opportunities dwindle when they become professionals partly due to a lack of preparedness to cope with the problems facing them in contexts often characterised by restricted professional norms and divisions of labour.

Part 3 is devoted to work practices as the analytical starting point. In Chapter 8, Anders Buch follows a group of engineers in a consulting company attempting to turn engineering work practices towards more holistic practices. Though reforms in engineering education tend to favour such practices, conditions and circumstances external to practitioners’ knowledge and skills are crucial for such changes. The article demonstrates how the practice landscape frame and limit the enactment of holistic work visions.

In Chapter 9, Rikke Premer Petersen and Anders Buch highlights the processes of design as material and conceptual practices that challenge conventional engineering approaches. They demonstrate how an existing and rather conventional mass-producing car manufacturer with well-established work procedures and standards for the division of labour was challenged by new needs and perspectives emerging from designs for the next generation of cars. In these designs, user experience is an important but difficult to identify quality used to market cars to high-end customers; at the same time, it is a potential competitive parameter that incorporates other elements into the core design. Introducing new design methods also implies networking and translating them to other parts of the company to legitimize and translate the approaches and legitimate new staging practices.

In Chapter 10, Søsser Brodersen and Hanne Lindegaard uncover a variety of ways in which users are represented in a medical company’s innovation, test and sales activities. These representations are constituted at the intersection of disciplinary practices, company procedures, user relations in terms of confidentiality and...
distance, competences of the involved engineers, and the ways data can be produced to mediate information between different parts of the company and different values assigned to data.

Chapter 11 presents a case study by Lars Bo Hendriksen on the largely wicked and undefined problems around the development of a manipulator in a wind turbine company. As new framings and organisational conceptions emerged, the object of engineering design and practice was re-defined and re-formattted to fit different managerial and utilisation contexts within the company in question. As an ‘actant’ within a network of socio-technical relations and with an agency of its own, the manipulator played an active part in reconfiguring and reconceptualising problems.

Vivian Lagesen presents a cross-cultural study of software engineers employed by software consulting companies in Norway, Malaysia and California in Chapter 12. She uncovers rather contradictory elements concerning values, gender norms, and dominant societal discourses related to gender and software engineering. While feminist scholars have characterized the field as masculine, her study reveals contradictory results. The study reveals the limitations of the idea of gendered practices resulting from basic characteristics of disciplines. It shows how societal structures, cultures, and discourses are crucial, and may even lead to counterproductive results. It also demonstrates the limitations of recruitment strategies that do not reflect changes in educational and work practices performed in education and work.

Part 3 concludes with Chapter 13, in which Joakim Juhl demonstrates the continued tensions between the vision of building straightforward mathematical models and the experiences of using them in production management practices. The context and organizational framing of the two work practices sustains this critical relationship. The study reveals that physicists and engineers have different priorities and produce rather different forms of knowledge and results to which no common legitimacy is assigned. On one hand, engineers seek professional credibility by transforming their modus operandi towards that of science, while physicists, on the other hand, pursue professional utility through extra-academic collaboration.

Part 4 is comprised of a single chapter. In Chapter 14, Ulrik Jørgensen and Andrés Valderrama synthesise lessons learned from the contributions presented in this book and reflect on how the presented studies of practices challenge how the engineering profession operates and how the perceived relationship between education and work is simplistic and results in problematic advice. In this chapter, the authors illustrate how the contributions demonstrate the challenge of translating societal challenges into engineering practice in education as well as in professional work situations. They discuss how institutional frames at different levels govern perceptions of the objects of engineering, how practices transform, and how engineers’ identity formation is a result educational frames, societal norms, and visions for outcomes of engineering and technologies. They further describe achievements concerning the application of practice studies and conclude with reflections on the crosscutting findings related to controversies about the knowledge base of engineering, the
interrelationship between education and professional work, as well as responses to
the societal challenges faced by members of the engineering profession.

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PART 1
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2. UNDERSTANDING EU AND DANISH HIGHER EDUCATION GOVERNANCE THROUGH A COMPARISON WITH US REFORMS

INTRODUCTION

In this contribution, we describe the changing landscape for higher education in Europe and Denmark under the Bologna Process, as viewed through the eyes of two historical case studies in US higher education reform. Our focus will be on governance. As a quintessential public good, higher education has always been within the province of the state. Nevertheless, educational institutions have long served broad economic objectives, where the state has played an active role in both financing and structuring higher education in ways specifically designed to support goals such as workforce development and the transition towards a supposedly ever increasing “high-tech” and “innovation” based economy. While traditionally these decisions have been made by state educational bureaucracies with the co-involvement of the legislature, the ascent of neoliberal economic doctrine and its practical manifestations within the educational sector have transformed the decision making process, as well as the institutional policies and structures designed to achieve meaningful alignments between public and private interests.

In this chapter, we open with a brief review of neoliberalism and present two US case studies that document the rise of neoliberal modes of higher education governance. After drawing out an analytic framework based on these studies, we apply this framework to assess both the extent and limits of neoliberalism as it has manifested itself within the Bologna Process, and the Danish national response to the Bologna Process in the realm of engineering education.

OUR APPROACH

The two US case studies that we introduce here are the 1960 Master Plan for Higher Education in California, and a second, state-wide study conducted during the midst of the Reagan-Thatcher Era in the state of Texas. Both were significant developments in the successive restructuring of US higher education. The 1960 Master Plan, as politically orchestrated by the President of the University of California system, Clark Kerr, firmly established a tripartite system for higher education within the state that

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produced one of the world’s most envied systems of public, higher education. Texas’ Select Committee on Higher Education, meanwhile, provides us with an explicit instance of higher education reform as driven by neoliberal social and economic policies. The contrast between the two case studies, in terms of governance, is quite striking. The California Master Plan came into being through structured negotiations carried out between well-established higher education bureaucracies comprised of the University of California system administration and California’s State Board of Education. By contrast, Texas’ Select Committee was a voluntary and largely lay body charged with charting a future for the state’s higher education institutions while contending with entrenched political interests.¹

Despite this contrast, it will remain important to pay attention to the underlying similarities that drove these two initiatives. In fact, very similar issues of demographic changes, regional differences, fiscal crisis, and the evolving economic interests of the state provided the underlying impetus for change, and in a manner not dissimilar from the broader circumstances that produced the Bologna Process. Nor could any discussion about higher education be limited to matters of economic development alone, for many civic concerns beginning with educational access and social mobility necessarily surfaced during the associated conversations. Given the strong, social democratic traditions in Denmark, as well as in many of the other signatories to the Bologna Declaration, how different social priorities are weighed and integrated into political and institutional processes under changing regimes of governance will be an important focal point of our analysis.

This work was carried out as a sub-project of PROCEED. Our task was that of documenting the institutional responses to the changing policy environment for engineering education in Denmark, and to do so through a set of site visits fashioned after a US-style external program review. Altogether, we visited four Danish universities and engineering colleges at five locations, specifically Aalborg University’s northern campus, Aarhus University and Ingeniørhøjskolen i Århus (IHA), Ingeniørhøjskolen i København (IHK), DTU, and the new Copenhagen Campus of Aalborg University. The visits occurred in October of 2012. Our account is based primarily on the information conveyed to us during our site visits. The latter half of this chapter will focus on our broad observations of the changes in Danish engineering education; the specific institutional responses, meanwhile, are described in Chapter 3. Given the limited scope of our visits, knowledgeable observers will want to view our findings more as an account of how our interview subjects chose to present their own history, as opposed to it being a full and accurate history of the relevant events. Still, it is our assumption that our observations provide a fresh perspective from which educators and policy makers can reflect on the changes they themselves are experiencing. Such is the advantage of any external review. This being said, we fully expect that our findings will contain errors of fact and of omission, especially as they relate to the broader policy context.
John Aubrey Douglass, in his historical account of California Master Plan for Higher Education, describes how the key to California’s success was a strong, semi-autonomous system of higher education governance as anchored by a constitutionally recognized board of regents for the University of California system. Though equally troubled by the changing fiscal picture for US higher education in recent times, Douglass expressed the worry, at the end of his study, that,

State lawmakers and the education community have not addressed the fundamental questions in the 1990s... the political culture of optimism has faded. State and local governments appear impotent to effect change, and the pressures of a rapidly growing and diverse population have set a new stage. (Douglas, 2000:324)

However, advocates of neoliberal educational reform may well reject this conclusion. Those who call for introducing greater market competition between universities by “re-engineering” higher education and for introducing new metrics designed to “improve student experience” hope that a very different political economic regime will induce positive changes. This new regime builds on the neoliberal push to introduce market mechanisms and accountability into public institutions of higher education with the hopes that this will produce stronger educational systems while simultaneously containing the costs of higher education.

From the point of view of the grounded analysis that animates this volume as a whole, it is in fact important not to cast either of the following US case studies as ideal types. There will be those who will recall the vehement protests directed at Clark Kerr for transforming the University of California into a “knowledge factory.” Entrepreneurial conduct and economic concerns about workforce development were critical elements in the origins of the California Master Plan; market-oriented conduct in higher education certainly did not originate with neoliberalism in the United States. And while some administrators may be eager to apply the latest measures of educational accounting and accountability, others remain sceptical about the efficacy of such techniques, and of “quality assurance” regimes that transform students into customers. The very question of what constitutes a “better” outcome is itself a significant point of contention, with various actors—both then and now—taking on different stances that range from research and excellence, to equity and access, workforce development, and the waning view that higher education should continue to represent something more than the economic desires of the state.

Given that we are foregrounding the question of governance, and the neoliberal turn in the second case study and its potential relevance to more recent developments in Denmark, we begin with a review of the scholarly literature on neoliberalism. While it may seem odd, at least to the uninitiated, to speak
about neoliberalism with regards to what some consider a quintessential public good, neoliberalism has never been about the removal of the state. As contrasted against the laissez faire policies of classic liberalism, neoliberalism has from its outset been about a rearrangement of state and private institutions. While some still see in neoliberalism a reduction in the role of the state – a contraction in government services designed to limit the role of the state to that of preserving market institutions – others see the process as one of redeployment, one in which the state may even significantly expand its activities in the name of promoting and protecting market interests.3

Renowned critics of neoliberalism such as the economist Joseph Stiglitz have declared neoliberalism dead (Stiglitz, 2008). However, although neoliberalism may have lost credibility among some academic economists, it has continued to circulate as a form of policy and, equally significant, a body of practice. The Marxist geographer, David Harvey, among others, has also made a distinction between theoretical and practical neoliberalism, with the latter referring specifically to concrete, and often politically motivated reforms undertaken in the name of neoliberalism. Others have turned to a study of the detailed practices of neoliberalism, including the routinized bureaucratic practices designed to actualize neoliberal policy intent (Vaquant, 2012:66–79). This can be seen, for instance, in the US engineering accreditation organization, ABET, and its turn from quantitative accreditation standards to “outcomes assessment,” or the Bologna Process and its emphasis on “quality assurance.”

Within the Foucauldian notion of governmentality – which focuses on the general coherence of the ideological regime set up by neoliberal ideas and epistemic practices as opposed to any pure and complete implementation – it is fully understood that neoliberal principles can be extended into state entities, including state systems of higher education. Thus, even as the public responsibilities of the state remain in the foreground – the education of citizens, the creation of a productive workforce, maintaining a path for upward social mobility – market mechanisms are introduced into public bureaucracies in ways designed, or at least intended to increase their efficacy in achieving these ends. Universities are encouraged to compete with one another for students; develop and introduce new instruments for outcomes assessment; redefine degree programs and reallocate faculty lines in more cost effective ways. Both the boasted achievements and the prevalence of faculty complaints indicate that such market reforms have found broad expression within higher education in recent decades. These reforms are clearly present within the Bologna Process.

Still, one of the dangers of a focus on governmentality is that once one dons this analytic lens, the scholar’s own ocular vision becomes rapidly narrowed to those aspects of institutional conduct that work primarily to affirm the postulated ideological orientation. This danger is amplified by the promiscuous interpretation of neoliberalism as viral and adaptive, as found for instance in Aiwha Ong’s studies (where the interpretation is justified) (Ong, 2007:3–8). If the unfolding of market
mechanisms within the context of state institutions are known to have their limits, what is to say that older, political and bureaucratic forms of governance do not remain dominant, and are in fact the more important means for achieving the civic goals that remain, if they do, at the heart of educational institutions? Still, Douglass may be right in lamenting the recent turn of events, if we have seen the atrophy of traditional higher education governance structures that were designed to keep market interests at bay.

This is the kind of concern that has prompted scholars in other areas to recommend that we turn to more empirical methods in documenting “actually existing neoliberalism” (Hilger, 2010; Vaquant, 2012). Both historical and ethnographic methods, including interview methods, remain an important means of documenting how and to what extent a rearrangement in the relationship between state and private institutions has taken place. Within the realm of higher education, we need to pay specific attention to the following:

• Documenting the actual neoliberal, market-oriented practices in higher education, including, where possible, their origins and effects,

• Conversely, describing the extent to which traditional political and bureaucratic processes continue to dominate the conduct of our institutions for higher education, and this at various different levels within an organization,

• Taking note of the extent to which other values, such as educational access or social mobility, continue to animate conversations in ways that limit neoliberalism’s discursive sphere, and

• Noting the extent to which market-oriented conduct within educational institutions antedates the rise of neoliberal economic doctrine, and conditions its uptake.

The last of these items does not necessarily undercut a neoliberal interpretation, in that established practices may acquire new life and vitality through the infusion of new economic thought. Nevertheless, any critical assessment of neoliberalism’s accomplishments must take into consideration how antecedent practices become folded into new social movements in ways that enable new economic doctrines to exert influence within a specific social and economic sphere. This is what we set out to accomplish in this study. We do so by first turning to the pair of US historical case studies.

DOCUMENTING THE NEOLIBERAL TRANSITION THROUGH US CASE STUDIES

We draw on two historical case studies from published studies as well as our own research to both illustrate and flesh out our ideas about alternative and hybrid modes of higher education governance. A comparative analysis of the two cases will then provide us with an analytic framework, grounded in specific issues and practices, for evaluating recent developments in Europe and Denmark from the standpoint of governance. The comparative analysis will also give us a grounded understanding
of the rise of neoliberal modes of governance and their significance in US and European higher education.

The 1960 Master Plan for Higher Education in California

The 1960 California Master Plan is probably one of the most important documents in the history of higher education policy in the United States. It was the product of demographic changes and the rapid post-war economic expansion of the state, as paired with a progressive social vision and a favourable post-war situation within the state’s treasury. Many in the United States feared that there would be a post-war recession at the end of World War II. Given the large number of returning veterans, a decision was made to soften their impact on the labour market by encouraging veterans to continue their studies. While the national manifestation of this policy was the 1944 federal G.I. Bill, the State of California was in a favourable position to extend the policy considerably further due to a flush treasury filled with taxes collected as a result of war production. As spearheaded by the progressive Democratic governor, Earl Warren, a basic decision was made to provide tuition-free access to higher education to all qualified residents within the state. Elements of a tripartite system actually preceded the 1960 Master Plan, with the University of California system, the California State Colleges (former teacher training colleges), and a smattering of junior-colleges all in existence before World War II. These different systems helped to absorb the returning students and channel them into appropriate levels of education (Douglas, 2000:190–197).

War production also produced a demographic explosion within the state, a trend that continued in the post-war period due to Cold War defence expenditures and the general strength of California’s economy. Between 1940 and 1960, California’s population rose from 6.9 to 15.7 million people, and would continue to rise to nearly 20 million people a decade later. This population expansion and the associated speculation in real estate created political pressures to create additional campuses within all three higher education segments, especially given the demographics and aspirations of this younger, mobile population. Because the University of California remained committed primarily to research and excellence, the main expansion occurred within the Cal State Colleges. In 1947, the State Legislature officially recognized that the Cal State Colleges were general purpose colleges, and not just institutions dedicated to teacher training. The University of California, in turn, began expanding its multi-campus system in response to the expanding size and role of the Cal State system (Douglas, 2000:188).

In the case of California, established institutions and governance traditions determined the course of events. Indicative of the strong educational bureaucracies that existed within the state, legislators were unable to simply spearhead a proliferation of state college campuses. Being former teacher training colleges, the state colleges were overseen by the state Department of Education and its Division of State Colleges and Teacher Education. While there had been a history of conflict between
this Division and the University of California President’s office, given their mutual concern about the proliferation of campuses and the associated risk of dispersing academic resources and talent, the two began working more collaboratively to limit the construction of new campuses. The result was a series of studies, consisting of the 1948 Strayer Report, the 1955 Restudy, and a pair of related studies and agreements in 1953 and 1958 that dealt directly with the engineering workforce requirements of the state. Of these, the 1948 Strayer Report was most instrumental in establishing the principle of the tri-partite system. Utilizing economic metrics as well as an argument about economies of scale, the report defined the appropriate sphere of responsibility for each institution and specified the minimum and maximum size for each Cal State and University of California campuses (Douglas, 2000).3

This is not to say that entrepreneurial conduct had no place in the post-war reshaping of California higher education. Far from it, the proliferation of university and college campuses resulted from entrepreneurial efforts that included everyone from local chambers of commerce, to city officials, alumni, real estate developers, and state legislators. Most notable, moreover, was the group of Cal State College presidents. In the absence of a formal governing board, the Cal State Presidents assembled themselves into an unofficial executive council that usurped many of the functions of the Division of State Colleges and Teacher Education. This was based on their judgment that the State education bureaucracy, which was directed mainly towards primary and secondary (K-12) education and teacher training, was not attendent to the expanding needs of the state college system. The “mission creep” of the State Colleges, from teacher training to general baccalaureate education, to semi-professional master’s degrees, and eventually to the doctorate itself constantly threatened to upset the tri-partite system, and was viewed with great concern by University of California administrators. Nor was entrepreneurial conduct limited to the State Colleges. At the University of California, Los Angeles, the inaugural Dean of Engineering, Llewellyn M. K. Boelter, created a continuing education professional master’s degree program to support the booming Southern California aviation industry. These highly specialized, technical master’s degrees came to eclipse the college’s undergraduate programs and worked to limit the college’s emphasis on faculty research; it also served as a model for the Cal State campuses, which began to press for professional master’s degrees in new and emerging technical fields.6

Nearly all of this is described in careful detail in John Aubrey Douglass’ study: ‘The California Idea’, a historical study of the origins of the California Master Plan (2000). But while Douglass identifies engineering as a “wedge issue” that repeatedly threatened to destabilize the functional differentiation between the Cal State Colleges and the University of California, he does not describe in detail how or why this occurred. While we also do not have the space here to go into this in detail, it is clear that the workforce requirements of Southern California’s aviation industry, and later, the defence electronics industries in Northern California (that served as the basis for Silicon Valley), created specialized workforce needs that fuelled the Cal State Colleges’ extension into new, advanced degree programs. As exacerbated
by a national engineering ‘manpower’ (sic) crisis, technical workforce shortages in Southern California had compelled the aviation industry to hire those with but a bachelor’s degree in engineering into increasingly professional and specialized positions. The intense engineering workforce requirements of this one industry, as exacerbated by events such as the Korean War, remade engineering by introducing new patterns of white-collar labour mobility, even as this helped to secure the engineer’s professional standing (Akera, 2010).

We note that a rather broad array of entrepreneurial conduct and market considerations animated higher education policies well before the general circulation of neoliberal ideas. But in the end, it was the established educational bureaucracy that gave shape to the 1960 California Master Plan.

The 1960 Master Plan firmly ensconced the state’s existing tri-partite system. While it affirmed the State College’s right to offer science and engineering master’s degrees, it essentially reserved all doctoral training, except in the field of education, to the University of California system. This is not to say that entrepreneurial conduct did not persist within the revised system. While those within the state colleges felt constrained by the new educational bureaucracy created for the state colleges, within the basic structure set forth by the Master Plan, Clark Kerr developed a subtle system of incentives to compel his campuses to compete with one another to achieve research excellence. Many states, including Texas, would adopt elements of the system of incentives developed by Kerr. The outcome attests to the efficacy of this approach to higher education governance: six out of the ten University of California campuses rank among the top 50 US universities today; three rank within the top fifteen universities in the Shanghai ranking of world universities.7

The Select Committee on Higher Education in Texas8

In contrast to the California Master Plan, the architect of the new system for higher education in Texas was a committee comprised of one higher education bureaucrat, five politicians, and thirteen political appointees. Among the appointees was a university president, several lawyers, businessmen (and one businesswoman), and a former deputy director of the US Central Intelligence Agency. The chairs of the House Higher Education Committee and the Senate Education Committee also sat on the committee. Chairing the committee was Larry Temple, the chair of the Coordinating Board, Texas College and University System, a controversial appointment given that his own committee was arguably the body under scrutiny.9

Texas’ Select Committee on Higher Education (SCOHE) also owed its origins to shifting economic circumstances, demographic changes, and a fiscal crisis. Like California, Texas got its start as a natural resources dependent state. However, by 1970, agricultural industrialization had already remade Texas into an urban population. Although peak oil struck Texas in 1972, as an oil producing state the OPEC oil crisis generated an economic boom, leaving the state’s treasury awash with cash. Texas’ fiscal golden years also occurred during the very period that the
baby boomers were entering college. Moreover, given that Texas’ economy was booming at a time when the rest of the nation was suffering from “stagflation,” Texas experienced its own demographic explosion, one that accentuated the pattern of Southern migration that had already begun by the 1970s.10

As contrasted against the constrained growth of the higher education system in California, Texas was one state that permitted the largely unconstrained growth of its higher education system. Local boosters and legislators pushed through legislation to create new campuses as educational access became a major selling point among real estate developers. As a result, by 1983 Texas had 37 separate public institutions for higher education as overseen by 15 separate governing boards. There were six separate university systems, three of which were organized on a regional basis. While college attendance was among the highest in the nation – when tuition and fees were both included, students in Texas paid less than those in California – so long as college expansion was tied to real estate speculation, the results were predictable. The state ranked 46th out of 50 in the SATs (Scholastic Aptitude Test, or the main, standardized test used for college admissions in the US). While the Coordinating Board was set up in 1965 to prevent such an outcome, the Board itself emerged as just another site for political logrolling. Despite the seeming conflict of interest, Temple was among the foremost advocates for reform.11

Texas’ fiscal situation changed drastically in 1983 with the collapse of OPEC. As a “tax free” state, Texas had no individual or corporate income taxes; given the reliance, as a consequence, on excise taxes, the state lacked the diversified tax base with which to cushion the blow of declining oil prices. During the 1983 session, the state legislature considered a 26% reduction in the state university budget. While the crisis was averted through a 200% increase in tuition (but still just $12/credit hour), the threat of campus closures, further projected budget shortfalls, and the reality of under-utilized facilities—in the most egregious case, campus enrolment hovered at just 1/3 of the predicted enrolment—provided the impetus to conduct an investigation.12

Given that all this occurred during the heart of the Reagan-Thatcher era, we might wonder to what extent neoliberal values and policies found explicit entry into the course of events. Certainly, there was a good deal of entrepreneurialism associated with the build-up of Texas’ higher education institutions. But in a manner not so different from the developments in California, most of what preceded the Select Committee’s work was, at best, an older form of market liberalism, and at worst, and even older form of interest politics. This being said, it will be evident that the existence of strong market traditions in Texas, and their integration with the political traditions of the state, provided fertile ground for the spread of neoliberal ideas and practice.

Neoliberalism entered the Select Committee’s conversations through at least two identifiable paths. The first was Austin’s successful bid to bring the Microelectronics and Computer Technology Corporation (MCC) to Texas. The state worked hard to attract the nation’s first research consortium, created in response to the US crisis in
“national competitiveness,” competing with other better known cities and regions such as Atlanta and the North Carolina Research Triangle. In fact, the entire state became struck with high-tech fervour not unlike the speculative excesses found in the state’s deep historical engagement with oil. Riding on the crest of this development, and rather eager to avoid a critical investigation that might damage the reputation of the state’s higher education system, Texas Governor Mark White instructed the Select Committee to focus on reshaping the state’s public universities to support this new high-tech economy instead of focusing too much on costs and campus closures. In the back of his mind was the fact that the populist political figure, Ross Perot, had just spearheaded a critical study of the state’s primary and secondary education system. In any event, it was White’s vision that the state’s public universities would produce the educated minds that would become “the oil and gas” of Texas’ future.\footnote{13}

Other elements of an emergent, neoliberal discourse entered the Select Committee’s policy deliberations, as it did in many other policy arenas during the era of Reaganomics. However, the other principal path through which neoliberal ideas entered directly into the committee’s deliberations was through the two members who were enmeshed in this national policy conversation. One was Adm. Bobby Ray Inman (Ret.), former Director of the National Security Agency, Deputy Director of the CIA, and now CEO of MCC. The other was the university president on the committee, Rice University President, Norman Hackerman. Hackerman was a well-known chemist and member of the National Academy of Sciences, and hence another Washington insider. Interpreting the Governor’s charge in predictably instrumental ways, these two individuals began sketching out a highly incentivized, market-oriented solution for expanding the state’s capacity to perform basic and applied research of value to new and emerging technological industries. Their plan called for creating a miniature version of the National Science Foundation (NSF) within Texas, and directing this body to the economic interests of the state.

As it turns out, Texas was already spending a considerable sum on research. However, it did so through a bureaucratized approach to appropriations that made the funds an institutional entitlement, based on annual allocations from a special fund controlled by legislative interests and politics. Inman and Hackerman worked to shift the discourse from that of entitlement to investment with the explicit promise of a return on investments. Specifically, they asked the state to set aside an amount equal to 10% of a 3-year running average of the amount of sponsored research paid for by the federal government in the state, and to allocate this to basic research in emerging technological arenas of interest to the state. The idea was to leverage state funds to capture the larger sums associated with federally sponsored research, which in turn would provide the foundation for setting up new industries in Texas. For many of the business-oriented members of the committee, their quick uptake of the idea was a natural, or rather, naturalized extension of their own, existing orientation towards speculation and investment. Inman and Hackerman’s proposal clearly built on a familiar language with which the many business-oriented members of the Select Committee could engage. On the other hand, in a curious hybrid that merged
commercial traditions with academic ones, the task force charged with working out this new Texas Research System sought to create competition among researchers in and across specific universities using an NSF-style peer review process. Along with a number of other provisions, this was a system designed to slowly wrest the control over the state’s research spending out of the hands of interest politics, which by definition favoured established industries versus new high-tech industries.  

While research was one focal point for the Select Committee’s actions, educational access also emerged as an important issue. During the committee’s very first meeting, and in response to the conversation about state subsidies for research, the Chair of the House Committee on Higher Education, Wilhelmina Delco (an African-American legislator from the liberal and urban political environment of Austin) indicated that she did not want the focus on excellence to occur at the expense of the poorest residents of the state. This was also a time when Mexican Americans were beginning to find greater political representation within the state. One of the reasons for the regional organization of the state university systems was to ensure that adequate resources were given to the educational needs of the state’s growing Hispanic population. (Texas would become a majority minority state in the first decade of the 21st Century.) As it turns out, Inman also emerged as one of the most vocal advocates for access. If the goal of high tech expansion was to sustain the State’s desire for economic expansion and population growth (which in policy documents was in fact conflated with economic growth), it made little sense to build an educational system that served only the elite. It needed to be a diverse system capable of producing a fully diverse and skilled workforce needed for a high tech economy. 

Internal differences of this sort, along with the influence of one of the powerful, conservative legislative representatives on the committee, would limit the Select Committee’s ability to thoroughly reshape Texas high education. The Texas Charter for Public Higher Education accomplished some of the Select Committee’s stated aims, especially through the expanded authority given to the renamed Texas Higher Education Coordinating Board (THECB). Nevertheless, this outcome also indicates the limits of a voluntary body. At one point, the Select Committee raised the possibility of inviting someone from California to speak about how they had structured their system via the 1960 California Master Plan. However, in so far as the committee divided its work into separate task forces, the group that focused on governance failed to see how one of the major benefits of California’s tri-partite system was that it concentrated state research monies within a specific segment of its higher education system. As contrasted against the frankly blunt system of incentives established under the proposed Texas Research System, Clark Kerr had developed a much more subtle system of incentives as administered by a sophisticated higher education bureaucracy in ways that placed its campuses in more direct competition with one another. Without a strong system of higher education and its experienced bureaucrats, Texas was simply unable to see other ways to structure state higher education policies.
Still, we should be careful not to judge the outcomes too hastily. As a result of the high-tech boosterism of which the Select Committee’s efforts were a part, the city of Austin, Texas stands today as a high-tech mecca second only to Silicon Valley. While Texas failed to develop an extensive network of strong research universities outside of the health sciences where it had historic strengths, given the competitive posture of US universities, it’s not clear that it would have been wise for Texas to attempt to do in the 1980s what California accomplished in the 1960s. The University of Texas-Austin, which had a rather modest reputation three decades ago, now stands among the top 20 public universities in the United States; it stands at #10 among all US engineering schools.17

COMPARATIVE ANALYSIS AND AN INTERPRETATIVE FRAMEWORK

From these case studies, we extract the following observations, which we then use to analyse the more recent developments in Europe and Denmark:

- **Entrepreneurialism** – Entrepreneurialism clearly has been an important part of the institutional changes in higher education. While neoliberalism may have accentuated certain aspects of entrepreneurial conduct, such as the rhetorical use of an investment metaphor, entrepreneurial conduct was already deeply rooted within US higher education well before the spread of neoliberal ideology. This was true not only in California, but during the period of speculative expansion in Texas’ higher education system.

- **Governance** – Educational bureaucracies at the state level have served as a vehicle for both defining and constraining the expansion of higher education institutions, although their efficacy apparently varies from state to state. Very different political and bureaucratic processes can shape key aspects of higher education within a state, and the capacity to develop sound policies appears to depend on the strength of the existing education bureaucracies.

- **Neoliberal Influence** – In the face of these two observations, we need to be attentive to the specific ways in which neoliberal economic doctrines influenced the conduct of both state and private actors. The devolution of federal authority for economic planning down to the states, increased reliance on public-private partnerships for both decision-making and research, increased reliance on competition, and new mechanisms for accountability all found specific expression within the Select Committee’s work and its recommendations. We note, nevertheless, that what we end up with are institutional hybrids, as when the practice of peer review became the chosen method for fostering increased competition among Texas’ research universities.

- **Geography** – Geography was another important factor in these two case studies, both in terms of the differences across the states, but also with regards to regional differences within each state. In both cases, regional differences created different patterns of demand for engineering and technical talent, even
as it constituted the political fabric upon which to carry out conversations about educational reform.

- **Demography and Access** – So long as public education is viewed as a means of attaining individual as well as collective economic ends, access will surface in political conversations about higher education reform. Demographic growth also strengthens the call for access. Given the opportunities and the substantial state investment in higher education, certain segments of the state bureaucracy will nevertheless join private interests in aligning state investments in higher education with the economic goals of the state. Such alignment is not unique to the era of neoliberalism, although the emphasis it receives may be amplified by it. Meanwhile, elite research universities, such as the University of California system in the first case study, may place research and other institutional goals above that of access.

With these observations in mind, we now turn to what we saw and heard about the Bologna Process and the associated changes in Danish engineering education, especially at the level of Danish national policies.

THE BOLOGNA PROCESS AND THE DANISH NATIONAL RESPONSE

The Bologna Process was initiated in 1999 through a meeting of the education ministers of 29 European countries. While expectations of professional labour mobility accompanied the Treaty of Maastricht, given the financial and monetary-policy orientation of early conversations about European integration, there was no strong focus on higher education and workforce development in these early discussions. The main concern behind Bologna was that European universities, despite the reputation of their leading institutions, were not producing the quantity and quality of graduates necessary to succeed in the global economy.

It is clear that a neoliberal policy environment undergirded the Bologna Process, much in the way that a broad context for neoliberal thought influenced the deliberations of the Select Committee in Texas. Building on two decades of conversation about national competitiveness, a basic decision was made to place European higher education institutions in competition with one another by creating a single higher educational market. This was accomplished by defining a European Higher Education Area built around a 2-cycle degree program consisting nominally of 3+2 years of study. But while the early focus was on the mobility of students between the two cycles – the Diplom. (bachelor’s) and Candidate’s (master’s) degrees and their equivalent – the process has generated interesting secondary phenomena. Perhaps most notable of these additional changes has been the emergence of more specialized degree programs at the Candidate’s level as made possible through the broader European-wide market for students (Adelman, 2009). Incorporation of the Lisbon Strategy in 2000, with its focus on research and innovation, has also expanded the scope of the Bologna Process to include
third-cycle (PhD programs) and short-cycle (vocational) educational programs (Keeling, 2006).

Geography also influenced the Bologna Process. Given the diversity and varying strengths of Europe’s educational systems, the education ministers were unwilling from the outset to unify their degree programs through a uniform accreditation standard. Although the ministers did agree to standardize the basic degree programs structure across Europe (although variations persist), beyond this they agreed only to “harmonize” their degree programs through greater transparency and accountability. In a clear draw on neoliberalism and its frequent emphasis on accounting and accountability, the European Credit Transfer System (ECTS) – a system originally designed to facilitate student transfers and study abroad agreements – was remade into a system that offered detailed measures of what was taught in each degree program. This was accompanied by a standardized assessment and “quality assurance” regime designed to guarantee stated learning outcomes, but as implemented through accreditation bodies in each of the member states. In addition to serving as a measure of earned credits, or “accumulation,” ECTS currently also serves as a proxy for faculty responsibilities and effort.

For US observers, it will be interesting to note that this means Europe has embraced a learning outcomes and assessment regime far more extensive than anything required under ABET’s EC 2000 accreditation criteria. This is the mechanism that has begun to form a single higher education market in Europe, as opposed to an accreditation regime designed simply to enforce minimum standards. Interestingly, the current conversations surrounding changes in ABET accreditation criteria point to the frustrations within the United States with regards to enabling educational innovation and variation under an accreditation regime (Flaherty, 2015).

The Bologna Process was preceded by decades of attempts from European Engineering organizations and the EU commission to establish a content-based framework of mutual acceptance and recognition. This had included stringent criteria defining the curricula elements, admission criteria, and lengths of study to be common for the EU. As an early outcome of this, a European system for individual accreditation of engineers was established with the ‘Europe Engineer’ certificate administered by the Engineering Association in the individual countries, but this only turned out to be successful with civil engineering. One of the obstacles to this attempt was the difference between the British individual certification of engineers based on examining trained engineers from Polytechnics and universities after some years of practice, and the system in continental Europe, which accepted engineering degrees as sufficient evidence of professionalism.

Political economic differences and market position have also influenced how the Bologna Process has unfolded across Europe. A biennial self-assessment conducted under the Bologna Process since 2005 has demonstrated that there has been substantial variation in how quickly the ten “action lines” (action items) defined over the course of three key ministerial meetings between 1999 and 2003 were picked up by the different EU countries (Terry, 2008). Taking the 2005 data as an
indication of early adoption, Scandinavian countries were among those that moved most quickly towards implementation, most likely because of their strong, social democratic traditions for governance. Joined by other smaller countries located in Europe’s periphery, the Scandinavian countries took advantage of the opportunities afforded by the coordinated market to create more advanced, specialized degrees, many of which are pegged to new and emerging high-tech industries. By contrast, the largest countries and their leading research universities have had less reason to embrace Bologna. As such France, Germany, and England have been among the late adopters. On the other hand, different segments within each country experienced Bologna differently. For example, the German Fachhochschulen have been successful in using the Bologna Process to extend industry-oriented, advanced vocational training to the Candidate’s level. By contrast, political processes have made this extension difficult in Denmark, forcing its engineering colleges to seek a variety of other strategies for their institutional survival.

We should also note that a more critical study, “Bologna with Student Eyes,” assembled by the European Students’ Union (ESU) in 2007, documents how institutions have been selective and opportunistic in their implementation of Bologna in ways that the official metrics do not capture. While the ESU report may itself be partisan in some respects, especially with regards to its emphasis on access, this is a key point to consider. From the point of view of a multi-scale, multi-site study on the institutional responses to Bologna, it remains important to document variation as well as conformance, both at the EU and national levels. Especially in the context of new policies favouring an “innovation economy,” it is precisely the institutional variation and specialization made possible through “harmonization” – not the full standardization of educational systems – that policymakers want to see. Using Denmark as a case study with which to document a national-level response to Bologna was precisely the core objective of our field work.

Denmark, along with the other Scandinavian countries’ responses to Bologna is unique because of their liberal political culture and the attendant emphasis on educational access and social mobility. While at the time of our visit there were student protests surrounding planned reductions in government subsidies for their studies, historically Denmark has spent a rather large portion of its wealth on public education. Based on 2009 World Bank data, Denmark spent 8.7% of its GDP on public education, as contrasted against the rates in Germany (5.1%), France (5.9%), United Kingdom (5.5%), and the United States (5.2%). Denmark also spends more than Sweden (7.3%) and Norway (7.2%). (More recent data were available for other countries, but not for Denmark.) In a manner unfathomable to those of us in the United States, students receive stipends simply for attending college. Denmark’s Gini coefficient, a standard measure of national income inequality, while no doubt buoyed by restrictive immigration policies, stands at 24.8, as compared to 27.0 for Germany, 32.3 for the United Kingdom, and 45.0 for the United States.

Similar in some ways to the immediate post-war period in California, this basic commitment to public education and a balanced class structure have shaped the
Danish national response to Bologna, although not without definite neoliberal elements. Indeed, concurrent to the post-war expansion in California, the Danish government established the Technician Commission in 1950 to suggest initiatives that could meet the growing need for skilled technicians and engineers during the post-war period. The focus of the commission was on the supply of relevant manpower to industry and the expansion of the capacity of engineering schools. The Engineering Academy was established to train engineers for industry without tapping into the recruitment of students with vocational backgrounds who were seen as still needed in industry (For further background see Jørgensen, 2007).

It is our understanding that the concrete manifestation of the more recent policy directions in Denmark has been a series of actions and government decisions. The most significant of these were the establishment of a national Globalisation Council in April 2005, the government’s adoption of a national globalization strategy in the policy document: “Progress, Innovation and Cohesion” (The Danish Government, 2006), and Parliamentary Law No. 562 passed by the Danish Parliament. This was an Act designed to merge the nation’s 150 specialized semi-professional colleges into a new system of eight regional University Colleges. This was done for the purpose of simultaneously expanding educational access, controlling costs, and upholding the status of “medium cycle,” or three-year, occupationally-oriented bachelor’s degrees. While PL 562 affected primarily these Diploma (baccalaureate) institutions, because of an initial decision to fold the nation’s engineering colleges (Teknika) into the University College system, this has had complex implications for all engineering degree programs and institutions.

The tension between neoliberal policies favouring a rational restructuring of Danish higher education and its efficient integration with global economic priorities; and social welfare principles designed to extend educational access are also evident in Denmark’s initial response to the Bologna Process. On the one hand, strong central government traditions enabled Denmark to quickly and efficiently embrace the 1999 Bologna Declaration. However, rapid adoption also contributed to a kind of policy failure. The initial vision for the Bologna Process led some to hope that the 3+2 structure would enable the government to off-load some of the costs of the higher, Candidate’s degree to corporate sponsors willing to pay for employees’ specialized training in their desired areas. Across Europe – with perhaps some exception in England – there has been opposition to such a shift. Danish per-capita expenditures in higher education in any case has remained one of the highest, if not the highest, among EU countries. This has only increased the Education Ministry’s resolve to find efficient solutions that ensure that societal and economic benefits accrue from this tremendous public investment in higher education (Schjær-Jakobsen, 2010). At a more general level, and in a manner analogous to the US case studies, these new policy initiatives in Denmark have sought to bring about a better articulation of the role of the public sector in producing the workforce needed for an era of purportedly intensified economic growth and competition.
Whether or not technology is changing faster than in prior decades, it is important to take note of Denmark’s technological sectors and how they have shaped national conversations about workforce development. Denmark has had considerable strengths in a number of sectors, including electronics, medical technologies, and mobile communications. While some sectors, such as mobile communications, have recently faltered, other arenas, especially alternative energy, global transportation and trade, and energy distribution systems have experienced resurgence amidst new concerns about sustainability and energy self-reliance. Selected segments within some of Denmark’s older industries, such as the new work on bio-fuels that grew out of Denmark’s strengths in agricultural technology and food processing, have also made a high tech turn. What we saw and heard during our visits indicated that these and other market segments somewhat more remote from engineering, such as those built around design, have buoyed the Danish economy, fueling hopes for an “innovation economy.” Meanwhile, a number of more traditional industries, especially international trade and manufacturing in Jutland, have provided a constant baseline of demand for a sizable Danish engineering workforce. This stable demand for engineering talent has, for many institutions, provided the tuition resources necessary to underwrite new degree programs and initiatives in engineering education. An engineering workforce shortage of about 8,000 engineers was anticipated in the coming decade at the time of our visit.

As compiled from our interview data, we regard the primary response of the Danish government to the current mix of opportunities and challenges presented by European integration and the Bologna Process to be as follows:

- A decision to embrace the Bologna Process through a desire to introduce market competition, greater specialization, and responsiveness within Danish educational institutions, especially at the master’s level.
- A decision to address both the (a) short term recessionary softening of the labour market and the (b) long-term competitiveness of the Danish workforce by having 50% of all high school graduates continue on to Baccalaureate-level instruction (B.Eng. or B.Sc.), and for 50% of these to obtain the more advanced Candidate’s degree (M.Sc.).
- Simultaneously, an attempt to contain the costs of higher education through rationalization, both through the legislatively mandated consolidation of the nation’s semi-professional schools into a single University College system, and through fiscal policies designed to force similar administrative restructuring within the nation’s universities. Many not-for-profit research institutes that were supported through public funds were also absorbed into the nation’s universities.

Taken as a whole, these state actions indicate broad alignment with neoliberal ideology, and especially with regards to the adaptive—and adoptive—character of neoliberalism, where market principles and conduct become embedded within
state and public bureaucracies, even as other agendas, especially social mobility and access, remain foregrounded in certain respects. The market orientation of the state’s overall policy intent was also evident in the effort underway at the time of our visit to define an “innovation” agenda that would determine how national research funding would be allocated to the universities. This report was issued shortly after our visit, in December of 2012, under the title, “Denmark—a Nation of Solutions.” This policy document is clearly framed as a response to the 2008 market collapse, which resulted in an actual 8% decline in Denmark’s GDP. Its text also belies a latent fear about the fragility of a small, Scandinavian country’s economy. The report clearly espouses the view that it is the government’s role to ensure that public investments in research, innovation, and education translate into economic growth and job creation. It recognizes the challenges of a country dominated by small and medium enterprises, and calls for strategic public investments to develop new market niches like sustainability and new energy systems where Danish industry has distinct advantages. More generally, the report calls for a more integrated and, again, rationalized system for the public financing of research. Reminiscent of the efforts in Texas, the basic outlines of the proposed system reveal the maturation of the kind of dialogue initiated by the Select Committee in Texas, and seeks in a much more controlled way to ensure that state investments in research becomes an effective strategy for market development. We should note that such policies extend further the conflation between the roles of public higher education and the demands of the marketplace (Danish Government, 2012).

Finally, there are a number of additional factors constituting the broader societal context for the present reforms in Danish engineering education. Not all of which relate to market interests or Danish national government policies. These factors all appeared to shape the responses of the universities and engineering colleges that we visited, and very closely mirror the issues that we identified as being important in the US case studies:

- Geographic factors having to do with the fact that Denmark has one major metropolitan centre (Copenhagen), and a large rural-industrial periphery (Jutland).
- A history of relatively limited labour (and student) mobility, which has created distinct regional markets for engineering education. (This contributed, for instance, to Aalborg University’s decision to open a new campus in Copenhagen.)
- Conversely, increasing labour mobility among engineering educators as a result of the European Higher Education Area, and the resulting faculty recruitment and retention challenges for Danish universities vis-à-vis their larger European counterparts (especially German universities).
- Social democratic commitments to relatively open enrolments within the public university system, which when paired with high matriculation targets for college enrolment, limited mobility, and a rigid system of enrolment based budgeting, severely limits selectivity within Danish universities.
CONCLUSION

This description of the major policy directions, first in US higher education, and then in European and Danish higher education points to a shifting policy landscape, one characterized by increasingly neoliberal modes of governance. This includes increasing market competition; a strong focus on workforce generation; attempts to rationalize higher education administration through new measures of accountability; and various efforts to align higher education and research to state and national agendas. For Denmark, the present emphasis is on a national “innovation agenda” designed to sustain Denmark’s position within an increasingly competitive, global economy. While it remains tempting to measure neoliberalism through its specific characteristics, what is again more fundamental is the general, underlying penetration of market values and practices into the institution of public higher education. There has clearly been a realignment of Danish and European higher education, as well as the systems in the United States, to more closely match up with commercial interests, metrics, and practices.

This being said, the diverse political economic contexts for higher education ensured that there were continuous efforts to balance economic interests with other socially-oriented policy objectives, such as educational access, social mobility, and the basic structure of a regional or national workforce. This is a central feature of public conversations about higher education that spanned both space and time. If Denmark’s actions are unique in the context of Europe, it is because it was among the set of smaller, peripheral states that embraced the Bologna Process more eagerly, even as its social democratic foundations helped to maintain certain non-market objectives in the foreground.

Focusing on the present, our visit to Denmark made it quite evident that Europe is in the process of thoroughly reworking its system of higher education. From the standpoint of a pair of US observers, the most striking thing is that Europe seems to be capitalizing on the strengths of its secondary education system to elevate their former, typically, five-year undergraduate degree programs into a set of terminal master’s degrees. Restated from the point of view of one of the perennial concerns of engineering educators in the United States, Europe has taken definite steps towards making a Master’s degree the first professional degree in Engineering. This has been an elusive goal in the United States, most likely because of a national commitment to educational access via its state universities and especially its land grant institutions. Moreover, the Master’s degree remains an orphaned degree in the United States, in that it is often considered a stepping stone for those pursuing a PhD (or worse, a soft landing for those who fail to obtain the PhD). In Europe these degrees are, it appears, being refashioned into specialized technical degrees that are tailored to the demands of the new innovation economy. While the United States has traditionally led Europe in college attendance, especially when junior colleges and community colleges are included in the statistics, Europe may well surpass the United States in
the production of students with specialized master’s degrees, if Denmark’s present policies prove to be a bell-weather.

Some of the other similarities and differences between the US and European/Danish developments deserve further comment. From the standpoint of governance, it’s clear that strong central governments and educational bureaucracies, as was found in California as a whole, contribute to the rapid and intentional transformation of higher education. On the other hand Europe as a whole has faced a specific challenge in the autonomy of its separate states and its multiple systems of higher education (not unlike the situation in Texas). Still, the extension of neoliberalism, with its unifying ideology and transnational reach, has provided not only the motivation, but the discursive forms and bureaucratic practices necessary to unfurl a fairly uniform policy framework in Europe, one with sufficient consistency to create the beginnings of a common market for higher education. In this respect, it is the United States that faces larger challenges. With fifty separate state systems for higher education and a national constitution that leaves most of the authority for public higher education to the states, the US as a whole lacks the governance structures needed to initiate a coordinated response to the developments in Europe.

What stands at the core of the Bologna Process is in fact a new combination of state actions and entrepreneurial and market-based responses—a clear “redeployment” in the relations between the market and the state. Amidst the complex ecology of higher education institutions in Europe, the Bologna Process has produced a flexible and “agile” approach to institutional change, one based on diverse responses whose mettle is currently being tested in the global marketplace for ideas. While we see some of this diversity at the European level, crucial to a full understanding of the Bologna Process’ impact is a look at the institutional variation that also exists within specific countries, such as Denmark. Indeed, to truly assess the scope of neoliberalism’s influence, we need detailed, institutional level data to observe how (and whether) entrepreneurial behavior and other forms of market-oriented practices are extending down into individual educational institutions and their faculties. This too was a focus for our site visits, the findings of which we report in the chapter that follows.

NOTES

1 Our discussion of the California Master Plan, while based partly on original research, draws heavily on prior work by John Aubrey Douglass (2000); See also California State Department of Education (1960); and Texas State Legislature (1987).
2 On Kerr’s own views of his efforts, see Kerr (1964).
3 For a review of the literature, see Hilgers (2010) and Hilgers (2012).
5 In Douglas (2000) the Strayer Report is described on pp. 184–194; while the Restudy is described on pp. 213–219. The legislature occasionally overrode the bureaucrats’ recommendations; nevertheless the agreements that emerged out of the Report limited the spread of new campuses.
The entrepreneurial conduct of the State College Presidents is captured in Douglass (2000) and is further explored in a paper by one of this chapter’s authors in Atsushi Akera (2010). On Boelter and UCLA, see Akera (2012).


SCHOE Transcript, 31 October 1985, p. 26. RG 100, AC 1989/76, Box 1/2; Carl Parker to members, Select Committee, 21 November 1986. RG 100, AC 1992/299, Box 7/SCHOE Correspondence from Members. Incomplete records of the task force’s deliberations may be found in “Task Force Meeting Minutes.” RG 100, AC 1989/76, Box 1, Folders 11–13. All in Texas State Archives. See also, Texas Charter for Public Higher Education.


This point is explored further in our other contribution to this volume (Chapter 3). See Juan Lucena et al. (2008:439).
REFERENCES


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