

Academic and Research Drift in Engineering Education in Europe and the United States¹

'Academic drift' refers to a long term process induced by educational systems' dynamics whereby vocationally and professionally oriented post-secondary education institutions with a focus on professional training, teaching, and learning strive to become like universities by incorporating university structures and emulating their values, norms, symbols and practices. In this process they increasingly aspire to research and scholarship. However, the role of research in academic drift processes in professional non-university engineering education has attracted relatively little attention in the literature on academic drift as the focus has up till recently largely been on the introduction of more theory in the curriculum at the expense of practice, on the vertical extension of study programs, and on the introduction of university courses in the engineering college sector. In this chapter we will examine three examples of research drift that have taken place in professional non-university engineering education institutions in Ireland, The Netherlands, and the United States, respectively, from the massive expansion of higher education in the 1960s to the present. More precisely we will examine and compare research drift in Irish Institutes of Technology, Dutch Hogescholen, and three American institutions – a public technical institute, a state teacher's college, and a sectarian liberal arts university, and with an eye to recent developments in Denmark. In reviewing the literature, we have the following questions in mind: What are the driving forces behind academic drift in non-university engineering education in Europe and the United States? Are these driving forces of a similar nature or do they differ? Is academic drift desirable for vocationally and professionally oriented programs, and if not, can it be avoided? What research mission are former designated non-university engineering education institutions in Europe and the United States aspiring to fulfill? What tensions and dilemmas does this new mission create in the above-mentioned kinds of institution?

Our goal is to better understand this significant and seemingly ubiquitous trend among post-secondary education institutions worldwide, and how it affects engineering education institutions outside the university – our main concern here – which are engaged as vital actors in the process. An initial hypothesis that we will further explore and qualify in the following is the assumption that under conditions of uncertainty, organizational decision-makers will tend to mimic the behavior of other organizations within their environments. Here organizational decision-makers would likely mimic the behavior of successful top-tier organizations to which they have some network connections via boundary spanning personnel (see Morphew and Huisman 2002, p. 497). Conditions of uncertainty might be created among other things by globalization, internationalization, marketization of higher education, strong competition for funding and students among institutions, greater access and widening participation, efficiency pressures related to resource constraints created by state withdrawal of funding, students as consumers, and credentialing pressures on students to be able to compete on the labor market and more (Molesworth *et al.* 2011; Tuchman 2009).

¹ This text is excerpted from Steen Hyldgaard Christensen and Byron Newberry: *The Role of Research in Academic Drift Processes in European and American Professional Engineering Education outside the Universities* to be published as chapter 2 in: Christensen, Steen Hyldgaard; Didier, Christelle; Jamison, Andrew; Meganck, Martin; Mitcham, Carl; Newberry, Byron (eds): *Engineering Education in Context: International Perspectives on Engineering Education* expected in 2014.

Martin Trow (Trow 1996, p. 25), in discussing continuities and change in American higher education, noted an important contrast between educational systems in Europe and the United States. In the United States, he claimed, a diversified system of higher education able to cope with a considerable expansion of student enrolments was put in place already by the turn of the 20th century, though the numbers that characterize mass higher education were still to come. According to Bruce Doern (Doern 2008, p. 9; see also Henderson and Kane 1991; Eckel 2008), the architecture of the American higher education system is among the most, if not *the* most, complex and diverse multi-level system in the world. It is composed of more than 4000 public and private colleges ranging from elite research universities to two-year technical and community colleges and four-year colleges. More specifically, the system consists of:

- Comprehensive colleges and universities that provide undergraduate and graduate level education
- Research universities that provide undergraduate and graduate level education and support the granting of PhDs through their research mission
- Community and junior colleges that offer associate degrees, baccalaureate-track courses, and vocational education and training

Martin Trow noted, by contrast, that in Europe the transformation of systems of élite higher education into systems of mass higher education took place from the 1960s and early 1970s onward. Prior to the 1960s, post-secondary education in Western Europe can be described as *university-dominated*. Higher education was the exclusive province of the university and university-level specialized colleges, including university-level engineering colleges. Vocational training in engineering, teacher training and nursing were not regarded as higher education and were offered by separate professional schools either to prepare for a specific occupation or to prepare for a profession (Kyvik 2009, p. 3).

In the 1960s and early 1970s a transition from *university-dominated systems* to *binary systems* of higher education, including engineering, took place in many European countries. It became increasingly clear that a broadly educated population could no longer be formed within and by the universities alone. Hence the new types of institutions were created *ab initio* to deal with increasing numbers, a more diversified student body, and a rapidly growing need for manpower in advanced industrial societies (Slantcheva-Durst 2010). These new institutions were of a comprehensive nature and have been variably called “universities of applied science”, “university colleges”, “institutes of technology” or “polytechnics” (Kyvik and Lepori 2010, p. 4). In the United States by contrast there is not a distinct, comprehensive system of polytechnic institutions. There are, however, institutions of technology ranging from elite institutions such as MIT and Caltech, to numerous local/regional technical and technological institutions serving local industries and trade (Doern 2008, p. 9).

Guy Neave (Neave 1979, pp. 156-157), the grand old man in comparative studies of higher education, has pointed to a set of objectives for institutions belonging to this new higher education sector that was created as an alternative to the autonomous university tradition in Europe. The objectives mentioned by Guy Neave are:

- Meeting the demands for vocational, professional and industrially based courses
- The creation of a separate sector of higher education outside the universities
- Greater public control to ensure continued responsiveness to social and economic demands of the locality
- Increased standing of vocational and professional education

The notion of academic drift as we use it here is meant to refer to the extent to which these objectives have been transformed in the move from a vocational/apprentice model to an academic model in professional post-secondary education. Academic drift may be seen as corresponding to what the Australian scholar Malcolm Skillbeck has alternatively called *academic creep* (Skillbeck 2003, p. 5) and to a certain extent to what the Dutch scholar Aant Elzinga has called *epistemic drift* (Elzinga 1985). In this chapter, however, we prefer to stick to the notion of academic drift as this is the standard use in the literature that we are reviewing. Specifically, academic drift in professional non-university engineering education is understood as follows.

First, academic drift at a curricular level encompasses a *cognitive dimension*. From this perspective, academic drift refers to a tension between practice-oriented and science-oriented curricula. Related to engineering it thus refers to the process whereby knowledge derived from practical engineering work experience and intended to be useful for industrial practice gradually loses its close ties to practice. Instead, engineering knowledge becomes increasingly theoretical and oriented toward engineering disciplines, including mathematics and natural science (Harwood 2010).

Second, academic drift in recent years, as already noted, has come to encompass a *research dimension*. The notion of *research drift* was originally coined by Svein Kyvik and Benedetto Lepori in 2010 (Kyvik and Lepori 2010, p. 9) as a descriptor of the transition in aspiring “wannabe” universities from vocational training and teaching primarily at the bachelor’s level to research-led and research-informed professional education taking place at the master’s level and beyond. From this perspective research drift refers to a cultural tension between the basic beliefs, attitudes, norms and values of a teaching culture as opposed to the basic beliefs, attitudes, norms and values of a research culture.

Third, academic drift also encompasses an *institutional dimension*. From this perspective, it refers to: 1) the question concerning the appropriate locus for educating professional engineering students for engineering practice, and 2) the question concerning the relative market value of credentials earned by students in diverse educational settings. More precisely, academic drift here refers to a tension between what are considered “noble” and “less noble” institutions (Furth 1982, Teichler 2008), and accordingly to a tension between narrow vocational training taking place in less prestigious, less selective, and less intellectually demanding institutions, and broad professional research-oriented and research-informed academic education taking place in prestigious, selective, and intellectually demanding and stimulating institutions (Burgess 1978).

Finally, academic drift also refers to a *structural dimension*. In this dimension academic drift operates across the entire non-university higher education sector to transform educational systems.

According to Svein Kyvik (Kyvik 2009), European non-university institutions of higher education seem to a great extent to have gone through three different, though overlapping, phases of transformations since the 1960s. The binary policy mentioned above was the product of phase two below. Formulated in an ideal typical fashion the three phases of transformations are:

1. *Fragmented expansion*. This phase is a reflection of the elite origins of higher education. The fragmented nature of educational expansion was aimed at differentiation and diversification by means of geographical and institutional decentralization. As a result, dual systems consisting of short-cycle vocational education and post-secondary higher education were established by the early 1960s, with a clear division between universities and the college sector. In this model, the college sector is fragmented into many small and specialized professional schools that offer short-cycle 2- or 3-year vocational courses. These small schools, based on vocational training, are not regarded as higher education institutions. Each of the schools has distinct vocational cultures and is subject to different public regulations.

2. *Horizontal integration*. This process aimed at field contraction, authority unification, institutional de-differentiation, program coordination, and regionalization. The outcome of this process, which took place from the mid-1960s and early 1970s until the early 1990s, may be characterized as a gradual transition to a binary model where the college sector came to be organized in comprehensive vocational, multi-profession colleges, sometimes termed polytechnics, alongside the university sector. Massification and expansion differentiated this second stage in higher education development from the elite origins of the university sector. To be able to cope with the massive expansion of higher education and an increasingly diversified student body, the new kinds of non-university institution were made more equal to the traditional universities than before and gradually appeared to be the less expensive part of the higher education system. The college sector now became subject to a common system of regulations.

3. *Vertical integration*. This phase, aiming at academization, field coupling, student mobility, structural convergence, network building and organizational integration, largely took place from the early 1990s onward. The outcome of this phase is characterized by a blurring of boundaries of the binary divide and a gradual transition to a unified system of tertiary education. In unified systems, both traditional academic studies as well as vocational programs are offered within universities. New demands also suggested that professionals should be trained more in research activities to apply and update innovative knowledge in their work (Griffioen and De Jong 2012, p. 2). Unified systems have been created in three different ways: by upgrading polytechnics, by merging traditional universities and other higher education institutions, and by incorporating professional schools into universities (Kyvik 2009).