Chapter 5
Understanding the Development of Technical Universities in Poland

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5.1 Introduction

This chapter aims to examine the past, discuss the present and speculate about the future of technical universities in Poland. Technical universities perform an important, though often undervalued, role in Polish higher education (HE) and undoubtedly remain an under-researched segment of the system. Therefore, this chapter presents technical universities as higher education institutions (HEIs) with special organisational features related to their strong organisational identity, which has a profound impact on how they address and strike a balance between numerous and often conflicting expectations. It explores the historical foundation of Polish technical universities, looking to the past to answer questions about their organisational attributes and behaviour as strategic actors (Vuori 2016) during turbulent times of political and economic transformation. Furthermore, it elaborates on the dynamically growing challenges that might affect the trajectory of their development in the coming decades.

Technical universities were first established to provide professional training, and as such, they were distinctively different from comprehensive universities in terms of organisational profile, governance model and social esteem. During the communist period (1945–1989), technical universities increased in number and societal and economic significance, and they developed rather steadily. The fall of the Iron Curtain marked the beginning of a period of turmoil and deep structural change in HE that embraced technical universities. There is rich literature on the transformation of Polish HE covering a wide range of topics, including the evolution of HE policy (Antonowicz 2015b), the rise of private-sector HE (Duczmal and Jongbloed 2007), structural changes (Kwiek 2012a), university governance (Dobbins and Knill 2009), research evaluation systems (Kulczycki and Rozkosz 2017), quality
assurance (Brdulak 2016) and changes regarding the academic profession (Kwiek 2003). Although a great amount of literature has addressed the institutional transformation of HEIs (Bialecki and Dąbrowa-Szewler 2009; Pinheiro and Antonowicz 2015; Kwiek 2012b; Antonowicz 2015b), little is known about technical universities specifically, although there are 23 technical universities in Poland educating around 320,000 students (21% of the student population in Poland). The reason for this might be that they are less politically sensitive and less exposed than other HEIs. The only attempt to explore this topic was performed by Maria Kostyszak, Jan Wadowski and Marcin Zaród (2015), who present the major common features of engineering education in Slavic countries.

There are several reasons why technical universities deserve greater research attention, including the fact that they stand out in the Polish HE environment as they are distinguished from comprehensive universities in terms of their profile, organisational culture and prestige. Despite this, technical universities have never been the crown of the Polish system of HE; this position was available only to well-established comprehensive universities in Cracow and Warsaw. Nevertheless, similar to many other European countries, technical universities have always played a highly important role and – as Chap. 2 in this volume acknowledges – possessed distinctive attributes, such as a focus on providing professional training in engineering and industry relevance.

Overall, the chapter has two major objectives. First, it aims to identify the sources of the distinctiveness of technical universities among Polish HEIs based on their historical legacy and patterns of behaviour as strategic actors (Vuori 2016) during a turbulent period of political and economic transformation. Second, bearing in mind the first objective, it aims to discuss the future of the development of technical universities in Poland. The analysis draws upon both quantitative and qualitative secondary data. The most important source is the statistical information published regularly by the Central Statistical Office (GUS) in a series of reports entitled ‘Szkoły Wyższe i ich Finanse’ (Higher Education Institutions and their Finances) (e.g. GUS 2016). The second most important sources are policy papers and discussions about the re-structuring of HE in Poland. The third are official statements published by the Conference of Rectors of Technical Universities (KRPUT1).

5.2 The Rise of Technical Universities

The rise of Polish technical universities needs to be considered independently of the development of the modern university. The concept of institutional autonomy was deeply embedded in the Humboldtian university model (Dobbins and Knill 2009), and the modern nation-state was supposed to protect universities from the

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1Note that the website of KRPUT (http://www.krput.edu.pl/) is outdated (the last updates was made on 27–29 October 2016), which indicates that this organisation is not very active.
interference of external stakeholders (in particular, corporate actors). This detachment from the external environment brought technical institutions of various post-secondary status closer to industry, leading them to become non-elite educational institutions. The establishment of this type of HEI was a direct consequence of industrial development and growing demand for highly trained specialists in engineering. Polish universities, by definition, did not provide professional education, except perhaps for law programmes, although these still required additional professional legal training and a final bar exam. In this way, technical universities were established as complementary and certainly not competitive institutions.

The country needed engineers to facilitate economic growth and fuel industrial development, but the process of establishing technical universities required a great amount of resources and time. From a broad perspective, technical universities were established in Poland in three major phases. The first phase dates from the late nineteenth century to the early twentieth century, and it is closely associated with the intensive industrial development that took place in Polish-speaking territories (until 1918, Poland did not formally exist as an independent state). The first institutions were established in Lviv (1877), Gdańsk (1904), Wrocław (1910), Warsaw (1915), Cracow (1919) and Poznań (1919). Technical universities were expected to supply new industries in these locations (e.g. mining companies, shipyards) with a highly skilled workforce to stimulate further growth of the economy. In the first part of the twentieth century, technical universities remained deeply in the shadow of universities and performed not only a complementary but also a supportive role to post-secondary education. This was a form of programmatic diversification (Mayo 2009) without a single element of competition, and the state played a prevailing role in fostering not only horizontal but also vertical diversification of HE. A landmark event that perfectly reflects the asymmetry of prestige between universities and technical universities was the all-national Gatherings of Polish Sciences that took place in 1920 and 1927. During these gatherings, academics discussed issues of high importance to academia in Poland. However, there were hardly any representatives from technical universities, and those that did attend did not play any role in the gatherings.

The second phase of the development of technical universities took place shortly after the end of World War II. Poland was not only destroyed by military conflict but also massively depopulated by its aggressors. The elite, best-educated citizens in Poland were targeted and executed as a part of policies of extermination implemented simultaneously by Soviet Russia and Nazi Germany. This created a huge (almost generational) gap in human capital. Shortly after WWII, Poland attempted to compensate for this loss by educating the new generation. Unlike traditional comprehensive universities, technical universities were able to provide professional education and expertise in the fields of engineering and agriculture. A number of technical universities were established, including those in Łódź (1945), Gliwice (1945), Szczecin (1946) and Częstochowa (1949), to support the growth of new industrial centres. Simultaneously, the central authorities established a network of regional Schools of Engineering, which were locally focused teaching institutions that initially relied on academic staff from the main technical universities. Once
they achieved a certain human capacity, they immediately transformed into independent HEIs.

In addition, in the post-war period, communist authorities favoured ideologically new (i.e. non-university) types of HEIs. They believed that less hermetic, less elitist and autonomous organisations would be able to provide more practical, down-to-earth education. Traditional comprehensive universities were depicted as ideologically hostile remainders of bourgeoisie society that served their own interests (Szczepański 1963). Strong critiques of liberal universities were published by leftist academics such as Józef Chałasiński (see Piskała and Zysiak 2013), and the Communist Party made numerous political threats to these universities, demanding more openness, diversity in the student body and subordination (Connelly 2000; Zysiak 2016). The concept of technical universities perfectly fit the ideological purpose of providing an alternative organisational model to the Humboldtian ideas about universities and served as a good example of responsiveness to the needs of the new (socialist) economy and society.

The third phase of the development of technical universities occurred from the late 1960s to the 1970s, and it is linked to the expansion of HE that occurred in response to the first generation born after the end of WWII and industrialisation of the country. This phase included the creation of institutions in relatively small cities, such as Kielce (1965), Rzeszów (1963), Zielona Góra (1965), Koszalin (1968), Białystok (1974) and Lubin (1977), marking the industrial development in regions that previously had been rural and lacked HE. Most of these institutions evolved from the previously mentioned local Schools of Engineering. In several cases, depending on their profiles, these later transformed into agricultural universities (e.g. in Bydgoszcz), while others transformed into technical universities, such as the Opole University of Technology (1996).

In addition to the three major phases, private HEIs with a technical profile were established after the 1990s to complete the already diverse institutional landscape of HE in Poland. Private HEIs were founded as primarily entrepreneurial organisations with more flexibility in curricula development and much greater concern about students’ needs than public HEIs. Private technical universities have neither become large nor very important among technical universities, but their establishment undoubtedly refreshed engineering education.

In short, technical universities were established in opposition to the idea of the (liberal) university, which embodied autonomy and academic self-governance, non-practicality and elitism. Using Peter Maassen and Johan Olsen’s (2007) framework, public authorities approached universities as institutions with distinct sets of values and social norms embedded in tradition, whereas technical universities, as newly established entities, have always been seen through instrumental lenses. This difference has had a massive impact on the trajectory of the development of technical universities, and it must be analysed in political, social, economic and geographical contexts.
5.3 Blurring Boundaries

‘Technical university’ has become an increasingly complex and dynamic category of HEI. Although such universities used to have a strong organisational identity, this has been recently challenged by the increasing expansion and privatisation of HE. In the early 20th century, as mentioned in Chapter in this volume, a clear line was drawn between technical universities and other types of HEIs, particularly comprehensive universities. Historically, technical universities focused on engineering education and were typically located in early industrial cities aiming to educate engineers to support the emerging industrial society of Poland. Only later did they develop a research capacity to provide knowledge and expertise in the field of technology. For decades, they enjoyed an almost monopolistic position in the field of technical education and did not want to develop into more comprehensive HEIs. However, this changed in the early 1990s due to political, economic and social transformations that enabled rapid expansion of HE (Pinheiro and Antonowicz 2015). The consequence of this process was a restructuring of the entire organisational field of HE that undermined existing boundaries; technical universities developed social sciences and humanities programmes, and comprehensive universities and other types of HEIs developed engineering programmes. The previously sharp, unquestionable distinction between different types of HEI became increasingly questionable. In addition, the newly established and dynamically expanding private HEIs, some of which offered engineering programmes, enriched diversity in an already complex organisational field.

Technical universities, as a separate category of HEIs, are scarcely recognised in the literature. In numerous analyses conducted on Polish higher education, only two major taxonomies of HEIs have been developed, which refer to the institutional setup (public and private) (e.g. Antonowicz et al. 2017) and, to a lesser extent, the institutions’ profile (academic and vocational) (Kwiek 2012a). It should be noted that, on the policy level, technical universities organised themselves via the Conference of Rectors of Polish Universities of Technology (KRPUT), a formal representative body of technical universities. This body does not include any private technical universities or agricultural universities, but it does include two maritime universities.

The most accurate way to define technical universities is the categorisation used by the National Statistics Office (GUS). According to this, there are 23 technical universities in Poland that are considered HEIs, among which 18 are public and 5 private, and 22 are academic, while one is vocational. For the sake of this analysis, I will use this categorisation. The list of technical universities and their profiles is presented in Table 5.1.

There are three major characteristics of technical universities in Poland. First, technical universities are extremely diverse with respect to organisational size; private HEIs usually have less than 1,000 students, while Politechnika Warszawska has 33,000 students. In total, 301,000 students attend technical universities in Poland.
which is 21.4% of the entire student population in the country, making these universities the second largest group of HEIs after comprehensive universities.

Second, technical universities stand out from other Polish HEIs due to their considerable proportion of full-time students. On average, 76.7% of their students are enrolled full-time, which is higher than the average across the HE sector (65.3%) (GUS 2016). Third, despite the great diversity in the size of technical universities, most are relatively large public HEIs with an academic research profile. These universities serve approximately 98% of the students at technical universities, and the view of Polish technical universities as public organisations with an academic profile is fully legitimised. Nevertheless, the fact that several HEIs have a technical profile and the uncertainty regarding whether private HEIs and marine and agricultural universities fall into the same category as technical universities create fuzzy boundaries within the organisational field of HE. In addition, the incoherence between membership in rectors’ conference for technical universities and the categories developed by GUS indicates identity problems among technical universities.

### Table 5.1 List of technical universities in Poland

| Name                                                                 | Status  | Profile    |
|---------------------------------------------------------------------|---------|------------|
| Polsko-Japońska Akademia Technik Komputerowych W Warszawie          | Private | Academic   |
| Wyższa Szkoła Ekologii I Zarządzania W Warszawie                     | Private | Academic   |
| Wyższa Szkoła Informatyki I Umiejętności W Łodzi                      | Private | Academic   |
| Politechnika Białostocka                                            | Public  | Academic   |
| Politechnika Częstochowska                                           | Public  | Academic   |
| Zachodniopomorski Uniwersytet Technologiczny W Szczecinie            | Public  | Academic   |
| Politechnika Gdańska                                                | Public  | Academic   |
| Politechnika Śląska W Gliwicach                                     | Public  | Academic   |
| Politechnika Świętokrzyska W Kielcach                                | Public  | Academic   |
| Politechnika Koszalińska                                            | Public  | Academic   |
| Akademia Górniczo-Hutnicza im. Stanisława Staszica W Krakowie        | Public  | Academic   |
| Politechnika Krakowska im. Tadeusza Kościuszki                       | Public  | Academic   |
| Politechnika Lubelska                                                | Public  | Academic   |
| Politechnika Łódzka                                                  | Public  | Academic   |
| Politechnika Opolska                                                 | Public  | Academic   |
| Politechnika Poznańska                                               | Public  | Academic   |
| Uniwersytet Technologiczno-Humanistyczny Im. Kazimierza Pułaskiego W Radomiu | Public  | Academic   |
| Politechnika Rzeszowska Im. Ignacego Łukasiewicza                    | Public  | Academic   |
| Politechnika Warszawska                                              | Public  | Academic   |
| Politechnika Wrocławska                                             | Public  | Academic   |
| Akademia Techniczno-Humanistyczna W Bielsku-Białej                   | Public  | Academic   |
| Wyższa Szkoła Informatyki Stosowanej I Zarządzania W Warszawie       | Private | Academic   |
| Wyższa Szkoła Techniczna W Katowicach                                | Private | Vocational |
Despite historically entrenched differences between technical universities and other HEIs, the line between them is disputable. This is partly due to HE expansion, the marketization of HE and, perhaps most profoundly, uniform policy measures implemented by the government. Paradoxically, while the traditional institutional identity of technical universities remains distinctive and strong, the boundaries between the profiles of HEIs and the organisational characteristics of different types of HEIs are becoming fuzzy.

5.4 Technical Universities in Turbulent Times

Since the early 1990s, the Polish HE sector has experienced substantial changes. Its path of development is often pictured as tumultuous, chaotic and driven by rapid expansion (Antonowicz et al. 2017; Kwiek 2010). Between 1990 and 2005, the number of students skyrocketed from 380,000 to almost two million, although by 2017 the number dropped to 1,405,000 (GUS 2016). HEIs have experienced many demographic shifts that changed them in a significant ways. The expansion of HE was largely fuelled by the growth in private-sector HEIs, but the growth of public HEIs (including technical universities) also contributed to the significant increase in the student population, mostly due to the introduction of fee-based part-time programmes (Duczmal and Jongbloed 2007). The massive demand for credentials turned many HEIs into ‘diploma mills’ (CHEA & UNESCO 2009) and made fee-based programmes their key source of revenue (Antonowicz et al. 2017).

Technical universities did not fully participate in this expansion because it was difficult for them to increase the number of students in engineering programmes due to the limited capacity of classrooms with sophisticated technical infrastructure. Moreover, demanding entry criteria, especially regarding advanced math, dissuaded many students from engineering programmes. Instead, technical universities grew by developed a wide range of full degree programmes in the humanities and social sciences, as these did not require any investment in sophisticated infrastructure. They were taught in literally any spaces that were available, including unexpected locations such as kindergartens or elementary school buildings as well as rented auditory rooms (on weekends only) in big industrial factories. The first wave of Polish transformation of HE can therefore be adequately summarised as the more the better (Pinheiro and Antonowicz 2015).

It is important to note that most analyses emphasise the demographic boom that caused HE to expand, but they tend to overlook another important human factor (Antonowicz 2015a). In the 1990s, a large number of people in Poland had not participated in HE before entering the labour market. Their professional career development was severely restrained, as higher positions in public administration and large public companies were often formally restricted to those with HE degrees (Antonowicz et al. 2011). Those individuals were interested primarily in obtaining credentials to re-launch themselves on the rocky path of professional development. It is essential to distinguish ‘degree hunters’ from the broader student population
due to their special expectations and purely instrumental (i.e. bureaucratic) approach to higher learning. It is not an exaggeration to claim that many of those students were keen on obtaining degrees but had little (or even no) interest in the quality of education. They were adults, most often employed full-time, that were interested in obtaining education part-time due to their professional commitments. Beyond any doubt, so-called ‘degree hunters’ were among the key drivers of the expansion of HE, and many private-sector HEIs wanted to meet their demands (e.g. Antonowicz and Borowicz 2006; Antonowicz and Gorlewski 2011). However, engineering programmes (a central part of technical universities) could not gain much popularity among ‘degree hunters’, and thus the student population, because these were seen as demanding programmes with respect to knowledge and skills.

The radical increase in student enrolment was caused by equally dramatic austerity measures imposed on HE in the early years of the political and economic transformation in Poland. With funding formulas based on the number of students and legal opportunities to charge tuition fees in part-time programmes, public HEIs had no option but to cater to the growing demands mentioned above. However, not every HEI had an equal chance to meet these demands and maintain its financial status. Among those unprivileged HEIs were technical universities, which had a limited capacity to provide more education due to logistical reasons (i.e. lack of infrastructure). Thus, if they stuck to their core mission, they risked serious financial problems. They had no choice but to launch several popular programmes that were outside the realm of engineering but consistent with their solid academic brand as technical universities. Therefore, their educational offerings expanded to include several highly in-demand (at the time) programmes, mostly those concerning economics, marketing and management, which could be run without much organisational hassle. However, technical universities did not follow the most popular path, rapid development of part-time education, which was the prevailing form of educational activity at the time. At the peak of the expansion (2005–2006), 48.7% of all students in HE were registered for part-time programmes. The highest proportion (75%) attended economic universities, followed by pedagogical universities (74%), comprehensive universities (56%), agriculture universities (31%) and medical universities (25%).

These numbers exemplify the variety of ways in which HEIs responded to the growing demand for higher learning as well as the consequences of the catastrophic drop in public funding. The fact that part-time education was only 32.7% of technical universities’ educational offerings at its peak demonstrates these universities’ conservative approach to the expansion of HE. Nevertheless, the number of students at technical universities increased from 75,700 in 1990 to 340,200 in 2015. This increase was mostly seen in full-time programmes, which, in principle, maintained quality standards, unlike many part-time ones (see Antonowicz et al. 2017). Thus, technical universities remained loyal to their core activity—full-time engineering programmes—but they also had to seek opportunities to compensate for the dramatic decrease in public funding. Instead of a panicked response, they took a more sensible position while part-time programmes. Contrary to many public universities and most private ones, technical universities never transformed into ‘degree mills’ or compromised their educational quality standards. As mentioned above and
referring to the question posted in Chaps. 1, 2 and 3 of this volume about the notion of a technical university, it is not always easy to draw a line between different types of HEIs. However, when dealing with dilemmas such as HE expansion or the balance of research and a teaching mission, the attributes of technical universities are distinct (Porac et al. 1995) in the broader organisational field of HE. Technical universities are particularly loyal to their organisational ethos, which affected their long-term strategies as well as their everyday choices and, undoubtedly, later helped them to mitigate the effects of the ‘demographic tsunami’ (Antonowicz and Gorlewski 2011).

In summary, technical universities responded conservatively to the spontaneous and dynamic changes in the external environment that were triggered by the fall of the Iron Curtain. Unlike many other types of HEIs, they were never the prime destination for ‘degree hunters’ and never transformed into ‘diploma mills’ like economic and pedagogical universities. This illustrates their strong identity and reluctance to be driven only by the quick financial gains produced by uncontrolled expansion of part-time education.

5.5 Reaching a Teaching–Research Balance in Technical Universities

As elaborated earlier, technical universities were established to provide advanced professional education, and research was largely left to (comprehensive) universities. However, due to the rapid changes in the structure of economy and political pressure to forge the triple helix of the university, industry and government (Etzkowitz and Leydesdorff 1995), technical universities could have become front-runners in knowledge production. Unfortunately, they were badly affected by the aforementioned catastrophic decline in public research funding and the growing demand for higher learning (and degrees). Most HEIs’ ability to commit resources to research weakened, a development that Marek Kwiek (2012a) rightly conceptualised as de-institutionalisation of universities’ research mission. Undoubtedly, the expansion of HE affected the composition of HE in Poland, blurring the line between its various segments. Extreme times called for extreme measures, and even some of the less prestigious technical universities located outside large metropolitan regions transformed into more comprehensive HEIs. In their educational portfolio, one could find programmes such as ‘administration’, ‘economics’, ‘sociology’, ‘physical education’, communication’, ‘journalism’ and even ‘German philology’, which can hardly be associated with technical education. Even more established and prestigious technical universities found it hard to resist the rapidly growing demand for HE and offered some popular programmes. This of course helped them to keep the books balanced as public funding was severely cut, but such a change could not be implemented without any side effects. Nevertheless, technical universities did surprisingly well compared to other institutions. Even during the heydays of the ‘educational drive’, technical universities maintained a fairly well-balanced structure of
revenue. In 2005, GUS (2006) showed that revenue from research in technical universities comprised 19.6% of their total revenue, which was considerably higher than in other types of HEIs, such as comprehensive universities (9.2%), economic universities (4.4%) and pedagogical universities (2.3%) (see Table 5.2).

Technical universities never lost their research focus, but it would not be entirely true to say that the expansion did not have any impact on them. With newly hired staff over-occupied with their teaching workloads and without a tradition of conducting research outside STEM, technical universities found it hard to undertake serious research projects in the social sciences and humanities.

The results of recent institutional research evaluation exercises in 2013 and 2017 illustrate the asymmetry in the quality of research conducted in ‘old’ and ‘new’ departments. The latter primarily addressed the growing demand for higher learning (and increased financial revenues) but many failed to produce quality research outcomes. Initially, the consequences were not tangible, as the whole HE sector was driven by rapid expansion and teaching performance was prioritised over other missions. In fact, the massification was strengthened by radical cuts in research funding that led to the de-institutionalisation of research in some scientific fields (Kwiek 2012a). In addition, technical universities had to re-organise their priorities based on the available resources and gravitate towards a teaching orientation. However, it needs to be underlined that technical universities did not lose their engagement in research; even a quick look at the structure of their operating activities demonstrates how important it remains (see Table 5.3).

Considering that a balance between teaching and research is one of the most challenging issues faced by the Polish HE sector, technical universities seem to cope with it well. Many observers may find this to be a surprise, but contrary to popular belief, technical universities do not prioritise maximising their teaching
volume. They are also the least dependent on revenue from education (meaning that they are less vulnerable to demographic upheavals), and they were least affected by the recent demographic decline. In short, technical universities stand out from the rest of the HE sector for their (a) organisational and financial stability and (b) well-balanced teaching-research missions.

5.6 Stability as a Key Driver of Organisational Development

Technical universities enjoy a solid and stable position in the HE system, and unlike pedagogical and economic universities, they do not have to be particularly concerned about the lack of clarity and sustainability in HE policy. After two decades of expansion, the government suddenly shifted its political priority from teaching to research, catching many HEIs in a trap. This did not affect technical universities. However, although this organisational stability is valuable, it also reduces the need for innovation and renewal. Indeed, with a solid foundation, stable funding and good internal reputation, technical universities have become reluctant to challenge well-imbedded and institutionalised patterns of performance, as evidenced by the low number of international students and poor activity in short-term professional post-graduate programmes.

The number of international students at technical universities is well below the national average. In contrast, before 1989, technical universities hosted a considerable number of international students. For the sake of this analysis, let us look back 50 years to obtain a good point of reference. In the 1966–1967 academic year, among the 1679 international students studying in Poland, 753 attended technical

| 2015          | Teaching activity | Research activity | Separate economic activities | Sale of materials and goods | Other operating activity revenues |
|---------------|-------------------|-------------------|------------------------------|-----------------------------|----------------------------------|
| Universities  | 77.4              | 15.1              | 0                            | 0                           | 7                                |
| Technical universities | 70.2          | 21.2              | 0.4                          | 0                           | 7.7                              |
| Agriculture universities | 71.1          | 14.4              | 4.8                          | 0.1                         | 9.8                              |
| Economic universities | 93.2           | 5.2               | 0                            | 0                           | 1.3                              |
| Pedagogical universities | 89.5           | 4.6               | 2.7                          | 0                           | 2.8                              |
| Medical universities | 80.5           | 11.9              | 0.2                          | 0.2                         | 7                                |
| Physical academies | 88.6            | 5.4               | 0                            | 0.1                         | 5.1                              |
| Fine arts academies | 92.7            | 3.6               | 0                            | 0                           | 3.7                              |
universities (MSW 1967). Together with medical universities, technical universities used to be the most internationally oriented HEIs, even though the programmes they offered to international students were mainly (if not only) in Polish. In addition, they attracted students from developing socialist countries in Africa and Asia through the government-supported programmes. However, the political upheaval broke ideological links and ended many funding programmes and the major source of international students for technical universities dried out. The educational market was changed as international HE was transformed from aid to trade (Knight 2008; Tilak 2011).

Technical universities failed to adequately respond to those changes, and unlike medical universities, they seemed to miss the window of opportunity to globalise (see Table 5.4). Medical universities still attract a considerable number of students from various countries overseas, but technical universities failed to adjust their educational offerings to the changing environment. Perhaps a part of the problem stemmed from the engineering profession; many countries require national-level certification, which does not fit well in transnational education.

Undoubtedly, the substantial economic crises in the 1980s contributed to the technological backwardness of the Polish economy and jeopardised the reputation of technological universities. Without political support, universities with good brands but a limited capacity to provide full degree programmes in English have little chance to compete in the global market. However, due to the growing demand among Polish students for fee-based programmes, technical universities easily found an alternative source of revenue. Among technical universities, only the Polish–Japanese Academy of Information Technology (8.33%) and, due to its location on the Polish–Ukrainian border, the Lublin University of Technology (6.21%) reported a level of internationalisation above the national average.

Not only did their problems with internationalisation indicate that technical universities faced difficulties in responding to the changing environment but also their engagement in another modern trend, lifelong learning (Field 2006), leaves much

### Table 5.4 International students in relation to total number of students in different types of HEIs

|                       | 2015/2016 | Total   | International students | % of international students |
|-----------------------|-----------|---------|------------------------|-----------------------------|
| Total                 | 1405.133  | 57.119  | 4.1                    |
| Universities          | 422.211   | 12.655  | 3.0                    |
| Technical universities | 301.142   | 6.280   | 2.1                    |
| Agriculture universities | 70.792   | 1.347   | 1.9                    |
| Economic universities  | 179.794   | 13.204  | 7.3                    |
| Pedagogical universities | 46.122   | 516     | 1.1                    |
| Medical universities   | 60.606    | 6.329   | 10.4                   |
| Physical academies     | 24.727    | 309     | 1.2                    |
| Fine arts academies    | 16.938    | 871     | 5.1                    |
to be desired. Contrary to popular belief, technical universities are not eager to provide life-long learning programmes, which are a cornerstone of smart economic development (e.g. Livingstone and Guile 2012). This is demonstrated by the relation between the number of postgraduate students registered for short-term programmes and total number of students registered for full degree programmes (see Table 5.5).

Poland stands out as the country with one of the lowest rates of participation in life-long learning, although one would expect professional universities to develop rich educational offerings for those who aspire to upgrade or update their skills and knowledge. Among all types of HEIs, technical universities seem to be the least committed to developing short-term professional programmes, and external dynamics did not force them to do so. This is rather unexpected since knowledge and skills in STEM become outdated quickly. In addition, among all types of HEI, technical universities are most commonly expected to act as leaders and role models by providing new knowledge and updated skills through a variety of short-cycle programmes for adult students. Although the education provided by HEIs has evolved into extremely heterogeneous forms covering a wide range of different modes and programmes, technical universities acknowledge their loyalty to traditional modes of professional education, which remains a pivotal part of their organisational identity. In contrast, private HEIs have been developed more as entrepreneurial organisations, and their organisational identity involves seeking opportunities to maximise revenue.

Over the years, technical universities have proved that stability is one of the strategic drivers of organisational development. Regardless of external dynamics, technical universities tend to stick to their core mission, avoiding interruptions by opportunities for quick financial gains. Neither international students (which are often seen as ‘cash cows’) nor the students enrolled in short-term postgraduate programmes seem to undermine their entrenched organisational patterns.

| Table 5.5 Number of postgraduate students in relation to the number of students registered for full degree programmes |
|--------------------------------------------------|-----------|------------------|---------|
| 2015–2016                                      | Total   | Postgraduate students | % Postgraduate students |
| Total                                         | 1405.133 | 127.517            | 9.1     |
| Universities                                  | 422.211  | 24.536             | 5.8     |
| Technical universities                        | 301.412  | 11.040             | 3.7     |
| Agriculture universities                      | 70.792   | 4.120              | 5.8     |
| Economic universities                         | 179.794  | 31.489             | 17.5    |
| Pedagogical universities                      | 46.122   | 6.152              | 13.3    |
| Medical universities                          | 60.606   | 1.669              | 2.8     |
| Physical academies                            | 24.727   | 677                | 2.7     |
| Fine arts academies                           | 16.938   | 761                | 4.5     |
5.7 Future Challenges for Technical Universities

This chapter shows that technical universities are undoubtedly the most stable group of HEIs in Poland thanks to their well-embedded institutional identity. Thus far, they have responded conservatively but reasonably to the often radical, spontaneous and chaotic changes in the external HE environment. Faced with the long absence of governmental steering in HE policy, technical universities, as strategic actors, followed their entrenched mission and chose a ‘secure’ path of development in very unstable times.

However, a strong identity and path dependency could be a double-edged sword and might become problematic if technical universities need a firm response to address challenges and take advantage of emerging opportunities. In light of welfare state crises (Kwiek 2014), rapid increases in globalisation (Drori et al. 2006) and the rise of the knowledge economy (Peters 2007), it may be necessary to deeply reflect upon the traditional role of technical universities. However, change is neither a quick process nor a simple task because, as shown in organisational studies, reforms need problems (Brunsson and Olsen 1993: 34–42). Paradoxically, technical universities are the least problematic actors in the HE system due to their reluctance to change. They enjoy a comfortable position because they (a) are the least affected by the demographic decline, (b) produce graduates with the highest income in the labour market, (c) have good relations with industry, (d) have almost no competitors in the private sector and, last but not least, (e) provide high-quality education to students.

How can this list of compliments possibly be seen as negative? Despite their great potential, technical universities may find few reasons to challenge their existing situation and take serious measures to transform into world-class universities; they seem to be reasonably satisfied with their current situation. This ultimately becomes a challenge in terms of public policy, which puts a strong emphasis on institutional excellence (Antonowicz et al. 2017), measured by universities’ position in global rankings. From this point of view, technical universities could follow the emerging global model (EGM) defined by Kathrin Mohrman (Mohrman et al. 2008) to develop a more adventurous agenda and become research-intensive universities. EGM stands out for the following reasons: universities’ mission transcends the boundaries of the nation-state, they educate students with a global perspective and they advance the frontiers of knowledge worldwide.

This would require far-reaching, transformative changes at technical universities, which, based on the current governance regime, bottom-up decision-making process and strong collegiality in these universities, might be extremely difficult to pursue. In addition, the relatively good financial and reputational situation of technical universities does not support implementation of more adventurous changes. Well-entrenched risk-averse cultures are typical in the HE sector as a whole, and only those HEIs under financial or reputational pressure manage to implement structural reforms.
To determine whether technical universities are able to transform into research-intensive universities, we must discuss an even more fundamental question: Who is supposed to define the role of technical universities? It is difficult to provide a straightforward answer regarding the future of technical universities in Poland because it depends very much on the upcoming reforming agenda widely known as Ustawa 2.0. HE policy assigns increasingly diverse functions to different types of HEIs, which may be a motivation for change. However, the policy evolves toward vertical rather than horizontal (i.e. different profiles) diversity. It produces homogeneous pressure that may lead to the gradual disappearance of the distinctness of technical universities and uniformity among the three categories of HEIs.

Summing up, this study underlines the major policy concern related to technical universities. It remains unclear whether the government expects technical universities to participate in the global ranking race and focus on research activities or to remain unique HEIs. Due to the growing popularity of global university rankings and their influence on HE policy (e.g. Hazelkorn 2015), may Polish technical universities lose their unique identity and evolve into comprehensive universities? This is a real option, but it is also possible for technical universities to follow their own path and adapt to, rather than adopt, external expectations.

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