Universities of Applied Sciences in Brazil and in Portugal from Conception to Practice

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Abstract

The primary objective of this study is to compare the conceptualized model versus the actual implementation of the Federal Technological University of Paraná (UTFPR) in Brazil and the Polytechnic Institute of Bragança (IPB) in Portugal, from its creations to the present day, in the institutional and pedagogical field. The two organizations focus on training professionals through more practical approaches, learning in close collaboration with industries and society, boosting regional development. Our research is justified by the fact that there are few studies on how higher educational organizations respond to the new demands in their local contexts, without violating their modus operandi. In Portugal, the higher education system is binary, composed of universities and polytechnics, whereas in Brazil, there is no designed system for higher education that distinguishes Classical Universities (CU) from Technological Universities (UT) such as UTFPR. The documentary evidence is composed of official documents and semi-structured interviews with managers involved both in the process of constitution of these organizations and nowadays. Data was treated using the Content Analysis technique. Firstly, this study showed that the organizations analyzed operated differently over the years. On its conception, UTFPR proposed an alternative model of university, however, after fourteen years there has been a departure from the characteristics of UAS, changingits university model. Distinctly, IPB remained faithful to the model devised in its creation, which to some extent also helped the institution to achieve national and international recognition, fulfilling its developmentalist mission.

Keywords Universidade Tecnológica Federal do Paraná · Polytechnic Institute of Bragança · Public policy

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Introduction

During the last decades of the twentieth century, there have been changes in the conception and purpose of universities (Kerr 1982; Howells et al. 2014; Harkavy 2006; Hasanefendic et al. 2017), also impacting higher education, which is not immune to the changes that affect society in the 21st Century (Willis 2011; Pucciarelli and Kaplan 2016; Harvey 2001; Hewitt-Dundas 2013). In this context, some authors believe that science has, as its main role, to strengthen the social and economic development of the countries (MacLaren 2012; Hewitt-Dundas 2013; Heitor and Horta 2014, 2016). At the same time, as the university is fundamental in the development and advancement of science and society, it exists in the same context and therein lies its main challenge. The goals and purposes that the university intends to fulfill are factors that drive the growth of science and technology in the world.

The university is the subject of numerous research studies. Among the published works, Kerr (1982), Dreze and Debelle (1983), Wolff (1993), Casper and Humboldt (1997), Newman (1951) and Perkin (2007) who philosophically discussed the origin, conception, models, and ideals of a University. Some authors have dealt specifically with the subject of Technological Universities (TU) or as they are internationally called Universities of Applied Sciences—UAS (Hamm and Wenke 2002; Du Pré 2004, 2010; Mckenna and Sutherland 2006; Scott 2006; Schaegger et al. 2007; Lepori 2008; Lepori and Kyvik 2010; Jongbloed 2010; Kettunen 2011). In addition, there are several works on the transformation in UTFPR (Romano 2000, 2005; Vitorette 2001; Guimarães 2001; Lima Filho 2005), but we have not found any reacent studies on UTFPR Likewise, research was carried out on Portuguese binary higher education, especially the Polytechnic Institutes (Amaral and Teixeira 2000; Fonseca 2001; Correia et al. 2002; Teixeira et al. 2004; Urbano 2008, 2011; Horta 2010; Dias 2012; Mourato 2014; Alves et al. 2015; Heitor and Horta 2014, 2016).

There is also a considerable amount of research on how higher education institutions manage the multiple new challenges arising from the demands of their political environment (Trindade 1999; Chauí 2003; Harkavy 2006; Harvey 2001; Rauhala 2008; Brito Cruz 2010; Horta 2010; Maclaren 2012; Pucciarelli and Kaplan 2016; Silveira and Bianchetti 2016; Hasanefendic 2018). We consider that it is increasingly more critical to understand how these institutions adapt to recent changes and shape their strategies for success in a new environment. Researches that present good practices are equally relevant to university leaders and the organization as a whole easing change processes within their organizations (Mckenna and Sutherland 2006; Baptista et al. 2011; Hewitt-Dundas 2013; Howells et al. 2014; Hoidn and Kärkkäinen 2014; Heitor and Horta 2016).

While most studies focuses on how universities should envision their change processes and new objective, there is still a limited understanding of how these transformations affect higher education institutions. Following this conclusion and logic, we opted to analyze UTFPR in Brazil and IPB in Portugal, created with different conceptions from other universities, and evaluate their behaviors based upon their stated goals.

Our research is justified firstly by its contribution to higher education literature referring to organizations as strategic entities in Brazil and Portugal that elaborate mechanisms within a complex and relatively recent field, such as UAS. The second perspective is the similarities that exist between Brazil and Portugal, as the low degree of institutional autonomy, low levels of internationally recognized funding, limitations in responding the demands of society and the long process of democratization of higher education. Societal challenges are also similar although at different levels, such as the need to increase formal educational qualifications of the population, an urgency to develop science, technology, and innovation which impact regional and national socioeconomic development (see Jezine et al. 2011; Heitor and Horta 2016).

In this scenario, we established as a general objective of our study to *compare the conceptualized model of these institutions versus the actual implementation of UTFPR and IPB, from its creations to the present day, in the institutional and pedagogical field.*

Research Methodology

From the point of view of the object, the research is a qualitative bibliographical research, of an applied nature. From the point of view of technical procedures it can be characterized as a comparative study. The corpus of the research was composed of semi-structured interviews, institutional documents of IPB and UTFPR, and legal documents of Brazil and Portugal. Through the snowball process, we choose interviewees with relevant experiences in the historical course of the institutions. In Brazil, saturation occurred in the 7th interviewee and in Portugal in the 15th. Rectors, managers, and teachers were interviewed, as well as members of the Agency for Assessment and Accreditation of Higher Education, of the Ministry of Science, Technology and Higher Education of Portugal and directors of the Coordinating Council of the Polytechnic Institutes.

To ensure anonymity, interviewees were coded as Interviewee (I) and numbered (1, 2, 3, etc.). The interviews were carried out in the cities of Ponta Grossa and Curitiba, in Brazil, and in Bragança, Mirandela, Porto, and Braga in Portugal, during January and September, 2018. The interviews were recorded and transcribed, resulting in 75 pages of data, the average interview lasted two hours. All responses were kept confidential, adhering to ethical procedures of scientific research.

To understand the origin, conceptualization, identity, and purposes of those institutions since its creation until nowadays, we questioned: What motivated the creation of those institutions? Was there already a model of UAS in the country? What was the initial conceptual proposal of this model? What is the current concept of university at UTFPR and IPB? Was there already an identity (in the case of UTFPR), and, if so, were there transformations? Which was the identity idealized in the creation of IPB and which is the current one? What are the considered purposes of those institutions when they were created and what are their current ones? Did the universities materialize their objectives?

To analyze the qualitative data, we used the Content Analysis technique proposed by Bardin (2015). After the interviews, 92 initial categories were grouped, of which 17 intermediate categories were constructed and from these the two final categories used in the treatment of results were extracted: (1) Origin, Conception and (2) Identity and Purposes.

The method used was comparative, which in Marc Bloch's words, when applied in the field of human sciences, consists on examining the similarities and differences between comparative elements that constitute two series of similar nature in different social environments (Cardoso and Brignoli 2002). To achieve the comparative method, we used Schneider and Schimitt (1998) adopting the following steps: (i) the selection of two or more series of effectively comparable phenomena, represented by UTFPR and IPB; (ii) the definition of elements to be compared: origin, conception, identity, and purposes; and (iii) generalization, identifying common elements in the two analyzed cases, but respecting their specificities.

Subsequently, we treated the results, separating convergences and divergences; selecting the answers that best served the research objectives, and allowing the inference and interpretation of significant and valid data, in relation to the expected objectives.

Results and Discussion

Origin and Conception of UTFPR and IPB

Based on the content analysis, we perceived that the two institutions had their origins driven by different reasons. In Brazil, UTFPR, the first and only Technological University (TU) in the country, emerged from the evolution of technical and vocational education (Lievore and Pilatti 2018). UTFPR was born as a Technical School[1] in the context of the Second Industrial Revolution, but as a university it emerged in the context of the Technological Revolution, being transformed from Federal Center of Technological Education (FCTE) to Federal Technological University of Paraná in 2005. In this scenario, UTFPR was not a State project, but rather an initiative of the institution itself, induced by changes imposed upon the Brazilian educational framework (Brasil 1996, 1997), which altered the path of professional education in Brazil, but without any connection with public higher education policies. The institution chose a path compatible with its reality (I1; I3), even though it was not widely understood (I1). Up to that moment, FCTE presented university indicators,

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[1] School of Armed Apprentices, created in 1909, was transformed into the Industrial Liceu of Curitiba in 1937. In 1942, through the Organic Law of Industrial Education (Brasil 1942), which integrated the organization of national education aiming to prepare workers for industry, transport, communication, and fishing, at secondary level, the Industrial Liceu changed into Technical School of Curitiba (*Escola Técnica de Curitiba*). Through the Industrial Education Reform of 1959, the Technical School of Curitiba became the Federal Technical School of Paraná (ETFP-*Escola Técnica Federal do Paraná*). In 1978, there was the most important transformation until that moment, when the ETFP was transformed into Federal Center of Technological Education of Paraná (UTFPR, IPP 2007).

conceived throughout its history, guaranteeing its transformation into a Specialized University (I1; I2; I3).

Thus, UTFPR had its **origin** in vocational schools, constituting a specialized university in the field of Technology. Following changes in the national legislation of professional technical education, UTFPR took advantage of an opportunity that was favored by its teaching, research, outreach indicators, and its strong relationship with the market.

In Portugal, the creation of the Polytechnic Institutes (PI) was the result of the intense debate that took place in the early 1970s within higher educational institutions throughout Europe (see Thiollent 1998), focusing on their objectives and organizational models (Fernandes 2010; Alves et al. 2015). In the case of Portugal, there were still factors that corroborated the implantation of a new model of education that propelled the combative education policy to problems related to demographic reduction, low economic development in the countryside, taking into account the decentralization and necessity of diversification of the higher education, in an attempt to level the Portuguese system with other European countries that had this model since the post-war period (Stoer 1983; Urbano 2008, 2011; Fonseca 2001; Almeida and Guimarães 2013; Hasanefendic 2018).

Differently from UTFPR, the Polytechnics of Portugal **originated** from a State policy proposed in 1973 by then Minister Veiga Simão. This project was consolidated only after the Revolution of April 25th, 1974, which overthrew the *Estado Novo* dictatorial regime, in power since 1933, and culminated in the implementation of a democratic regime with the new constitution of 1976. The Simão's reformist law remained in stand-by until 1979 and only after this period, the IPB instituted its reforms with two schools, Education, created in 1980, and the Agrarian Higher School, created in 1981 (I17). In general, the technological institutions in Europe were created with a different conception of the universities (Du Pré 2010; Hasanefendic 2018; Pilatti and Lievore 2018); providing a faster response to the labor market, a more applied and vocational education, with an applied research component (Haug and Tauch 2001; Hasanefendic 2018). In the Decree that approved the polytechnics in Portugal (Portugal 1979), Chapter I substituted the designation "higher education of short duration" for "Polytechnic Higher Education" (art.º 1.º) " with identical value to university level". Though the system were legally equivalent, interviewees (I1; I12; I17; I19) reported that the initial challenge, which could also be considered the first great triumph of IP, was to earn the credibility of society. According to I10 "We needed to beat the social suspicion on the quality of education given". As was already the case in some European countries, Polytechnic education in Portugal has overcome the precarious democratization of access to higher education and the lack of diversification in this teaching (Grácio 1998; Urbano 2011, I23). The need of diversification was highlighted in the interviews, justified by the need of answering new market demands, typical of the twentieth century, as specialized labor force and an education closer to the job market (I10; I12; IE17; I19; I22; I23; I27, I28).

Our analysis suggests that in Brazil, the initial proposal for the creation of UTFPR was to provide the country with a differentiated **conception** of university, with a peculiar identity and social function, which would be the driving force behind

the creation of socially significant knowledge and technologies, for the promotion of technology, offering courses in technological areas, with a more applied bias, linked to the labor market and acting together with social development. To help in this process, international experiences were analyzed, such as the *Fachhochschulen* (FH) from Germany, the *Universités des Technologies* of Belfort-Montbéliard, Compiegne and Troyes in France, and six North American Technological Institutes. These different institutions, especially the French and German ones, were used as references to UTFPR as to its conception and working (I1, I2; UTFPR, IPP 2007). UTFPR proposed to fill a supposed gap in the university-enterprise relationship, which was a result of the historical and real distancing of these social actors (Pilatti 2016). This view corroborates with Pilatti and Lievore (2018) who identified the emphasis on the relationship with the business environment as the great differential of UAS. This link includes: an internship and the completion of courses linked to problem solving and solutions which meet the requirements of industry and society; the emphasis on technological research and outreach projects that focus more on the market push–pull model and less on the science-push model. Despite the conception of Technological University composed by the elements mentioned above (Pilatti and Lievore 2018), these characteristics are getting lost, according to the interviewees. What still sets UTPR apart from other universities in the country is its history, but this distinction is gradually reducing, and the university model is progressively becoming like the classical one.

The IPs of Portugal were born within a binary system of higher education, with a well-defined theoretical **conception**. The original idea was of an institution that offered short courses, with a more applied teaching, vocational, and building a strong relationship with the market. In addition to this conception, fomenting the democratization and diversification of higher education, the PIs aimed to assist the social and economic development of the countryside regions of Portugal, which according to I10, where an individual's potential and real world skill building remained unfulfilled. Educational and cultural opportunities, which would not exist in these regions, were created with the institutionalization of polytechnics (Smith 2006; Urbano 2011; Alves et al. 2015, I10, I13, I14). Fernandes (2010) and Alves et al. (2015) carried out researches that confirm the economic impact of IPs in the regions. Among the PIs analyzed, there was a variation of 2% to 11% in the regional GDP and growth in the supply of jobs in these regions. In terms of regional GDP, the less favored regions, were those that presented better outcomes. Fernandes's (2010) research highlights the role of IPs as employers and, consequently, as producers of qualified people in their respective regions. In addition, for each euro spent by the State and made available to the Polytechnics, between 2.63 and 8.07 euros were generated through economic activities. The impacts of polytechnic institutes in Portugal go far beyond the economic dimension, improving socio-cultural aspects, promoting benefits and equal access to higher education for these regions (I10, I27).

According to studies carried out by IPB (2012), the economic impact of the Institute in the region reaches 66.2 million euros corresponding to 11.02% of the GDP of Bragança and Mirandela. In addition, IPB is the second largest employer in number of employees in the region. As I28 has reported, the richest countries and areas in Europe are those with a good polytechnic system, as Germany and

the Netherlands; "What has truly been demonstrated is that economic impact are not the universities, universities form people", but it is the polytechnic system which raises productivity, increases employment, and provides positive economic benefits to both the individual and the region.

Our analysis has also shown that even though there was a distinction between the subsystems, divided into university and polytechnic, the conception of polytechnic institutes was not yet perceptible to society, since the idea of polytechnic education as one of a lower quality teaching prevailed. We found that the lack of understanding of the concept of polytechnic institutes resulted in a movement to turn them into universities, based on the fact that historically higher education is recognized as being "the university". If this change had occurred, there is a perception that there would be no depreciation towards the Polytechnics. Although this idea emerged around the 2000s, some faculty believe this remains to this day. Urbano (2008, 2011) and Tavares et al. (2008) argue that the "feeling of prejudice" with polytechnic education is reflected in the low demand for this model of education. Such conception results from the idea that training in a polytechnic is less positive in terms of social and professional status, interfering or even defining the placement of the professional in the labor market. However, Urbano (2011) concludes that unemployment is not related to the type of training, but to the low capacity of recruitment and investment by the productive sector, corroborating studies by Harvey (2001). If they had become universities, perhaps the PIs might not be necessary in all regions of the country. What made them develop was precisely the fact that they were different, offering an alternative for students who seek a different formation from CU and those who are in the countryside.

Analyzing the way forward, it is inferred that in Portugal all polytechnic institutes were created with the same objective, but the IPB presented different solutions to the political demands imposed, waiting but not receiving, qualification of the teaching staff and strengthening its connection with the greater community, fostering the social and economic development of Northern Portugal. This differentiated behavior strengthened not only the IPB, but, above all, the very concept of the Polytechnic Institute. The IPB developed an image, a brand, a concept that is now respected, recognized and copied by other Polytechnics. One of the effects of this new perception is that currently no Portuguese Polytechnic is interested in becoming a University, as IPB are predominantly seen as developmental tools of the State. Teaching for practice, less academic and more professional training, and the economic contribution brought to the regions helped IPs, and fundamentally IPB, to build a proper concept of "university". Through this concept, IPB is continuously intensifying its relationship with the business world and with society, gaining visibility, credibility and recognition.

In other words, it can be said that this conception meets the ideal proposed by Veiga Simão (2008, p. 68) in which "the balance in the conceptions of university and polytechnic will reside essentially in the weight that each institution will be assigned by the its strategic programs […], such as: strategic vision, cultural dimension, internationalization, regional impact, research". Analyzing this perspective, the IPB has a very well-defined conception.

Our analysis shows that the path taken by the IPB was different from the one by UTFPR in Brazil. UTFPR had its origin in technical-vocational education and worked to change its name (for university), when it began to offer an education, while still vocational, but at a higher education level of. In contrast, IPB was created to offer higher level vocational technical education but had to prove that it did not need the name "University" to be recognized nationally and internationally.

It is also pointed out that in the twenty-first century, where one of the major challenges of higher education is to train people for professions that do not yet exist, vocational higher education is the largest incubator of the next generation of professionals because there is no other way to train qualified professionals, to be prepared for the constant technological changes, other than in environments of practical teaching and applied research. This model of institution, with a technological bias, has been gaining more relevance precisely because it has a differentiated proposal, with innovative teaching practices and above all for exploring and benefiting from the relations with the market.

Identity and Purposes of UTFPR and IPB

From the vision proposed by Caldas and Wood (1997) understands the concept of organizational identity as "central, distinctive and enduring." But to meet the new organizational configurations, Caldas and Wood (1997, p. 9) suggest new axis opposed to the first—"power to be fragmented, non-distinctive and ephemeral." Such a conception reveals that identity is no longer viewed solely as an "autonomous, static, enduring entity," but as a process that must be continually under construction, and can be "acquired and lost through periods of authenticity and falsity."

Based on these concepts, our research reveals that there is still a lack of clarity of the **identity** of UTFPR and according to some interviewees (I1, I2, I4), this may be associated with the lack of tradition of Technological Universities in Brazil. CUs was are normally grounded and rooted in centuries of tradition.[2] UTFPR does not have the tradition of a Classic Universities, and this makes it more prone to changes and trends directly compromising its identity that represents its concrete reality. The numerous changes undergone by the UTFPR, in addition to political demands and social pressures, may have de-characterized the university's identity over time, leaving it without a definite meaning for society and for itself (Romano 2005).

While the Institutional Political Project—IPP (UTFPR, IPP, 2007) brings identity as a concept inherited from its historical trajectory, referring to its performance in specialized knowledge. Interviewees I1 and I2 claim that, after more than a decade of existence, it is not clear what constitutes a TU, what makes the identity of UTPR gradually more vague: "If you talk to the professors of UTFPR this perception is limited. I mean, the idea of a TU is simply one university that offers courses on

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[2] Compared with Europe, Brazil was delayed by almost three centuries in university education, and initially obeying pragmatically the needs of the elites (Cunha 2002; Sguissardi 2006; Shigunov Neto and Fortunato 2016). The process for consolidation and structuring of Brazilian universities was slow and complex, throughout the nineteenth and twentieth centuries (Cunha 2002).

technology and engineering" (I2). In the perspective of interviewees, the identity was very clear when the institution was a FCTE, a period in which much was established in terms of identity, differently from UTPR in which it was not known what a TU was. When they asked for a transformation, it was only clear that it was supposed to be a university different from the classical model (I1; I2) I4 explains that there was at the time of FCTE a well-designed identity, but one of an institution that prepared for a technical level. With the challenge to learn how to prepare a professional different from before, a higher education professional, "(…) *the institution was a bit lost, it got lost in the sense that it lost a bit of its identity"* (I4, 2017).

The transformation of UTFPR into a university has led to changes in its ideal, its conception of technological education, the profile of those involved, and its relationship with the market and with society. Our analysis recommends that, after 14 years since the of creation of UTFPR, its **identity** requires greater attention and formalization, through institutional documents that register and direct the institution, its pedagogical projects, proposals and curricula in the chosen path, that is, a UAS. The identity established or idealized in its origin has been transmuted and what had been constructed as FCTE has not been completely lost and can be adapted to the now UAS. Although dynamic and complex, the identity is subject to constant redefinition, and needs to be rethought especially when major institutional transformations take place, without detracting from what has been historically constructed, which will act as a reference point for the institution.

While UTFPR needs to build and establish its identity in accordance with its current reality and ideology, our analysis shows that in the case of **IPB**, its **identity** is recognized by the community. There has been an attempt since its inception to keep the identity idealized in the Veiga Simão Law. On the basis of the results analyzed, it is inferred that IPB managed to preserve, almost religiously, its main ideology, which was responsible, in its almost 40 years, to solidify its bases while constantly transforming itself to adapt to the legal changes, such as the Bologna Declaration (Portugal 2005), and the Statute of the Teaching Career (Portugal 2009). Although there was a movement that doubted the maintenance of the binary system, in the last decade, what happened was a decrease of this wish (I10; I12; I14; I27; I28). This is due, to some extent, to the OECD Report (2018), in which the Organization reaffirms the importance of maintaining the binary system in Portugal, since Polytechnics are key to respond to a specific niche market, students of vocational education. Polytechnic Institutes (PI) saw an opportunity where universities, in the view of the I27, were not interested, "Universities have never found this a very valuable challenge, let's say they thought it was second-rate, taking short courses in higher education and continuing these students to the teaching degree." In addition to assuming this task, the IPB never understood as a conflict the fact of opening up the spectrum of higher education, both for vocational students, focusing in short courses, such as education for those over 23 years, with relevant and internationalized research. This perspective of a shorter formationis in line with the new global trends expected by employers (World Economic Forum 2018).

Obviously, each Portuguese PI presented heterogeneous responses to political demands, but IPB maintained its focus and sought to establish its identity by assuming its polytechnic mission. Our analysis, which considered the historical path of the

IPB, corroborates the research presented by Urbano (2011), which emphasizes that there is an identity, though unfinished, but that there are still barriers to be broken such as the offer of doctoral degrees and higher recognition by society. In addition, our analysis confirms Urbano's (2011) thesis on the need for polytechnics themselves to carry out the exposition of their identity, based on the principles of Caldas and Wood (1997) so that all can understand what the institution is (central character), how it is distinguished from the others (distinctive character) and its conceptual (lasting) roots.

Due to the success achieved in the proposals and projects, the IPB is considered by the other polytechnics, the Institute[3] with the best practices and strategies (I10; I19; I21). According to I21, the IPB has always had its own identity, supported by the scientific capacity of its faculty, with scientific production of quality and impact, resulting in a greater number of projects funded and international visibility. The identity assumed today by the IPB is of an institution strongly linked to the industrial sector, with emphasis on training projects, applied research, and close to the labor market. All conquered by its innovative stance and strategic vision that resulted in regional impact, in the cultural dimension and in internationalization, the latter strongly designed in the IPB.

The purposes of both UTFPR and IPB are expressed through their missions, assisting in the institutional agenda, the orientation of projects and programs and in the relationship with other social instances. Romano (2005) points out that in addition to being clear, the mission of a university should not be defined and guided by its activities (research, teaching and outreach) but rather by the role of these activities (purposes and social benefits).

In this perspective, our analysis shows that although in the law of creation of the UTFPR the **purposes** involve all the aspects that characterize a TU, the same does not happen in institutional documents, since its stated purposes are directed to teaching. This orientation may result in a limited interpretation of teachers's roles in this university, leaving aside another essential function of TU professors, the role of a "researcher-outreacher". Obviously, education plays an important role in providing skills for innovation (Hoidn and Kärkkäinen 2014) and in meeting the demands and market needs (Harvey 2001; Pucciarelli and Kaplan 2016), but this situation ends up shortening one of the central characteristics of UAS: a more relevant contribution to society, with complex technological and economic demands.

We perceived in the analysis that, due to the crisis in the identity of UTFPR, it is not possible to guarantee a set of purposes capable of even distinguishing UTFPR from other universities in Brazil. For I4, prior to delimiting its purposes, UTFPR needs to answer some questions, such as; "[…] what is a UTFPR-trained Engineer? What is a UTFPR-trained Technologist? This is above identity, I think the identity of the professional that we form builds the identity of the UTFPR itself." Considering that these questions still do not have an answer, our analysis shows that the

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[3] IPB has been continuously considered the best Polytechnic Institute in the county, by the international rankings SCImago, U-Multirank, Thomson Reuters; and the Academic Ranking of World Universities (ARWU 2018).

official purposes of the UTFPR creation law, and partly in the IPP (UTFPR 2007) do not reach the documents closer to student's education, which are the pedagogical projects of each course. This was stated by I4, "When you start from these more generic institutional documents and can make them influence and build … it is in the pedagogical projects of the course, that's where I train the professional, based on the pedagogical project." In this way, if the pedagogical projects do not reflect the purpose proposed by its organization, the Institution does not materialize its policies and it does not reach its objectives. It is necessary to act in a cascade effect, reaching all operational documents, curricular guidelines and disciplines thus impacting the profile of the student formed by UTFPR.

By this, we can infer that the purposes proposed in 2005 in the law of creation of UTFPR still do not support the Educational Projects of the Courses (EPC), thus, the professors, who are in the front line for the formation, do not see the purposes of UTFPR as UAS. This lack of alignment impacts the reality of the university, whichis increasingly approaching the Classic Universities model. Even the newly promulgated new Institutional Development Plan—IDP (UTFPR, IDP 2007) does not bring this conceptual appeal.

In the case of IPB, our analysis showed that there is a greater alignment between the proposed purposes and the reality of the institution. This can be seen in the testimoniesof the interviewees and in the data presented by the institute (IPB 2012). We can translate IPB's aims into its *raison d'être*, which is of fundamental support to the Northern Portugal, with training which reflect the existing labor market, especially in technological areas whose profile was not met by the Classic Universities. In addition, there is a political purpose of co-opting people in the interior, establishing practical knowledge, attracting companies and investments with the purpose of directly assisting the development of the region. (I10, I13, I14).

Our analysis shows that, based on the purposes proposed in the law, specifically in item "d", the IPB fulfills its role, even though it is located in a region not favored by industrial development (Hasanefendic 2018; I10; I12; I14; I19) and even facing serious problems of aging and desertification (I10; I13), IPB is one of the main drivers of development in the region, boosting employment and moving the Portuguese economy (IPB 2012). From this perspective, it is possible to believe that the IPB is developed in a more utilitarian perspective, which to some extent is more common in Europe and in the USA. In Brazil, the relations between science and technology is still a complex and much debated subject in with the academy (Brito Cruz 2007; Pilatti and Lievore 2018). We saw that there are three aspects that aided IPB in the pedagogical organization to fulfill its mission. First, the bet on "more professional training". The second, an increasingly imminent aspect, refers to the role of the polytechnic as an engineof development (see studies by Fernandes 2010), and that for each euro spent by the State to finance IPB, almost 4.13 euros is gained through economic activities in the cities of Bragança and Mirandela (IPB 2012). The third aspect concerns applied research, with a strong connection to what the real needs and regional problems brought by companies, public bodies and society.

After 40 years since its creation and even with all legal changes, we can infer that IPB assumed its mission, responding positively and with quantifiable gains to not only what had been idealized and proposed by Veiga Simão in 1979, but has

surpassed it. The institution has committed itself to new political demands and in some cases, anticipated them. IPB has reinvented itself, rebuilt its identity, and guaranteed its growth an international space.

Synthesis of Results and Discussions

Table 1 presents a comparative synthesis between both institutions analyzed in the research.

We have seen that the path taken by IPB was different from the trajectory of UTFPR. UTFPR had its origin in technical-vocational education and worked for the change of its name to TU, when it started to offer a still vocational education, but mainly at an undergraduate level. In contrast, IPB was created to offer a vocational technical education of higher level, however it was necessary to work to proof that it did not need the name University to be nationally and internationally recognized. Analyzing the paths followed, we conclude that the distinct behavior strengthened not only IPB, but the very concept of the Polytechnic Institute in Portugal, considering the reference image institutionalized by IPB.

Throughout its history, UTFPR has undergone several legal and organizational changes, which have departed from the characteristics that make up a UAS, gradually approaching it to the model of the Classic Universities and thus altering the model devised at the time of its transformation. This provoked a certain displacement of what it was supposed to be and do, which would enable the desired boost to the regional economy and recognition by society.

Conclusions

Based on our comparison, we conclude that over time the two institutions responded to the challenges imposed in different ways. In fact, there was a change in the model idealized by UTFPR. This is explained if we consider that, as a result of an impositional process, UTFPR needed to design its new model along the way, as, in Brazil, there was no clear delineation of what was or what would be an UAS. Because of this and the policies implemented over the years, UTFPR responded similarly to other Brazilian universities, which follow a traditional model and, as a result, caused a distortion of the ideally defined path.

In contrast, IPB, which was also conceived with a different conception of universities, focused on economic and social development, besides being part of a governmental strategy of diversification and democratization of access to higher education, has always presented a well-defined model. This, in some measure, has eased the path taken by the institution, which was faithful to its idealized model.

It is worth mentioning that, as Brito Cruz points out (2007, 2010), the demand for certain results and contributions that the university can offer are not always fundamental to it or part of its *raison d'étre* (Brito Cruz 2007, 2010). This view can be understood as a critique of UAS and the referenced model (Pilatti and Lievore 2018). Utilitarianism, in the perspective of Brito Cruz (2007, 2010) has two wings:

Table 1 Synthesis of origin, conception, identity, and purposes of UTFPR and IPB

		UTFPR	IPB
Origin		Consequence of the Evolution in the technical-professional education in Brazil	Consequence of the intense debate on Higher Education in Europe in the early 1970s
		Transformed from a CEFET (Federal Center of Technological Education) into the Federal Technological University of Paraná after changes in the legislation of basic technical education in Brazil	Created to deal with problems related to demographic reduction, low economic development, and need to diversify higher education
		UTFPR did not originate from a State polity, but by an initiative of the institution itself	IPB originated from a State policy, implemented by the national government
Conception		An institution different from the classic universities, which would propel socially useful technologies, offering courses in technological areas, a more applied and vocational education, connected to the job market and strongly working towards social development	To offer a quick response to the job market, a more applied and vocational education, with a component of applied research, strongly working on regional economic development
		The greatest distinction was the emphasis on the relationship with the market	Created within a binary system of Higher Education, with a theoretically well-defined conception,
		The current conception still mantains the same idea, but some characteristics have been lost. What still sets UTFPR apart from other universities in the country is its history, but this is increasingly lower- making it progressively similar to the model of classic universities	Initially, the conception was not noticeable to Society, that perceived polytechnic education as one of lesser quality. Currently, through internal policies, IPB has strengthened its connection with the territory and boosted social and economic development in the region, presenting a clear conception
Identity		There is a lack of clarity on the identity of UTFPR, which can be associated to the lack of tradition of Technological Universities in Brazil	Its identity is recognized by the community, even in a European level
		After 14 years of creation, the identity of UTFPR requires more attention and formalization, though institutional and pedagogical documents	IPB has kept its focus and tried to establish its identity assuming a polytechnic mission. Today,IPB's identity is strongly connected to the industrial sector, with emphasis on applied research and close to the job market

Table 1 (continued)

	UTFPR	IPB
Purposes	The pedagogical projects do not reflect the purposes and objectives of UTFPR. Thus, the institution does not implement its policies and does no reach the aims of a TU	There is a greater alignment between the proposed ends and the reality of the institution in the institutional documents and pedagogical practices
	The purposes proposed in the law that created UTFPR are still not supported by the Pedagogical Projects of the courses, leading professors to not perceive the purposes of UTFPR as a TU	The purposes are expressed in the support to the region, with a formation closer to the market, especially in technological areas. Besides the political aim to attract people to the countryside, attracting businesses and investments to the region

Source The authors (2020)

on the right, which determines as the main function of universities the support to companies, fostering competitiveness and economic growth; and the utilitarianism on the left, which sees the university as the protagonist in the role of directly helping society, to be richer, healthier, and less unequal. Both objectives are legitimate, relevant and necessary, especially in developing countries such as Brazil and Portugal. The mistake is to entail to the university alone the responsibility to achieve them.

The university should contribute to economic and technological development, but its main role, for Brito Cruz, should still be the training of professionals who produce knowledge. The uniqueness and specification of the function of the university is to educate people to work with knowledge and thus contribute to the solution or reduction of social problems. However, for us it would be a false dichotomy or a logical fallacy to consider this situation as an absolute truth by placing two alternative and opposing views as the only two options of university ideals when, in reality, there are other options not being considered.

As a limitation of this research, there is thetime factor, which directly influences all analyzed variables. UTFPR is considered a young university, only 14 years old (since its transformation), while IPB, at 40, has already reached an institutional maturity that allows it a more advanced state. This difference, for an educational organization, is extremely significant, as it rigorously impacts its internal organization, policies adopted and the response to these policies. Another limitation of our research is that the results obtained cannot be generalized to all polytechnics, as they present internal administration and different experiences, but may guide other researches on the same theme.

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