Chapter 1
Public Policy Implications to Innovation and Technology

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1.1 Introduction

Over the last decades, higher education systems have been exposed to multiple "public policy reforms" due to restrictions of public funds, stakeholder pressures, educational trends, and socioeconomic shakeouts. Pioneer studies about public policy and higher education have provided an in-depth analysis of complex state policies and their affectation on university strategies and communities, especially those oriented toward enriching students learning conditions (John et al., 2018). Regarding innovation and technology, since the 1980s, studies have evidenced the significant advance of public policies oriented to reinforce technology transfer within higher education (Guerrero & Urbano, 2021a; Crow et al., 2020), as well as the replication of successful transformation legislative patterns across the globe (Gores & Link, 2021; Guerrero & Urbano, 2021b). However, the link between public policy agenda and university managers' strategies demands more information to clarify the innovative and technological outcomes (NACIE, 2011). Indeed, the COVID-19 pandemic forced public authorities to engage in immediate adjustments to a wide range of higher education policies. The immediate policy action most often taken by governments was to allocate additional research funding to priority research areas

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associated with the pandemic (OECD, 2021, p. 21), affecting the discovery process with universities (Siegel & Guerrero, 2021). This chapter analyses how public policies have redirected the way universities develop core functions, access public resources, collaborate with local/international actors, and generate value for society. Directly or indirectly, this analysis provides interesting insights into the emergence and evolution of university capabilities.

The remainder of this chapter is organized as follows. Section 1.2 highlights the higher education public policy that has influenced both evolution and emergence of university managers' abilities and university capabilities. Section 1.3 introduces some higher education sector trends. Section 1.4 highlights the discussion, and we conclude by outlining policy implications.

1.2 Higher Education Public Policy

1.2.1 The United States

In the 1980s, the Bayh–Dole Act was the most significant public policy that enforced the development and management of university inventions and technological advances (Guerrero & Urbano, 2019; Crow et al., 2020). The result was multiple inventions and technological discoveries across American universities. It was unsurprising that adaptative transformation legislative patterns were implemented worldwide, aiming to foster the socioeconomic contribution of universities via educational, technological, innovative, and entrepreneurial outcomes (Gores & Link, 2021; Guerrero & Urbano, 2021b). This legislative act was the starting point of university managers' entrepreneurial and innovative abilities regarding university innovative and technological outcomes—consequently, the development of entrepreneurial and innovative capabilities within North-American universities (Siegel & Phan, 2005; Phan & Siegel, 2006). After fourthly years, this legislation has continued impacting the technological and innovation advances and university managers' abilities to manage knowledge and intellectual property (Guerrero & Urbano, 2021b; Dabić et al., 2016, 2022). It has promoted the emergence of entrepreneurial and innovative capabilities among university managers, university students, and university professors.

In the 2000s, the US Secretary of Commerce policy discussions focused on the leadership of universities. According to the National Advisory Council on Innovation and Entrepreneurship (NACIE, 2011), the areas of discussion were promoting student innovation and entrepreneurship, encouraging faculty innovation and entrepreneurship, actively supporting university technology transfer, facilitating university–industry collaboration, and engaging in regional and local economic development efforts. In 2018, the United States Agency for International Development (USAID) published the public policy framework for higher education, which considers higher education a central actor in driving sustainable local

development (USAID, 2021). Concretely, this higher education program framework includes educational reforms, organizational transformations, and individual abilities oriented to three core university functions (USAID, 2021, p. 2): advance knowledge and research, provide quality and relevant education for workforce, and engage and strengthen networks and communities.

Adopting the USAID principles (equity-inclusion, data transparency, local ownership, and sustainability), this program looks for outcomes, such as capacity development and reinforced partnerships in sustaining a continued performance across university functions, and is the central actor in developing/managing solutions to local problems (USAID, 2021). Consequently, university managers/leaders have responded to public policy pressures by developing innovations and technological advances that have been transferred and commercialized without ignoring sustainable and digital views (Guerrero & Urbano, 2021a). Figure 1.1 shows how this framework has reinforced the pre-existing university capabilities (entrepreneurial and innovative) as well as the emergence of new ones (sustainable).

After the COVID-19 pandemic, according to the American Association of State Colleges and Universities (AASCU, 2022), effective public policy is vital to sustaining a high-quality, affordable, and accessible American public higher education system. In this regard, the 2022 Public Policy Agenda (PPA) focused on two main purposes: (a) outline the most beneficial policies to students more affected due to the pandemic and (b) provide a guide to react to unanticipated policy and political developments (AASCU, 2022, p. 3). Concretely, this PPA concentrated on pressing issues confronting universities:

- Affordability looks for financial vitality by removing barriers for students.
- A campus climate that guarantees to fulfill university missions, including teaching and social engagement (minorities, first generations, undocumented individuals, and others).

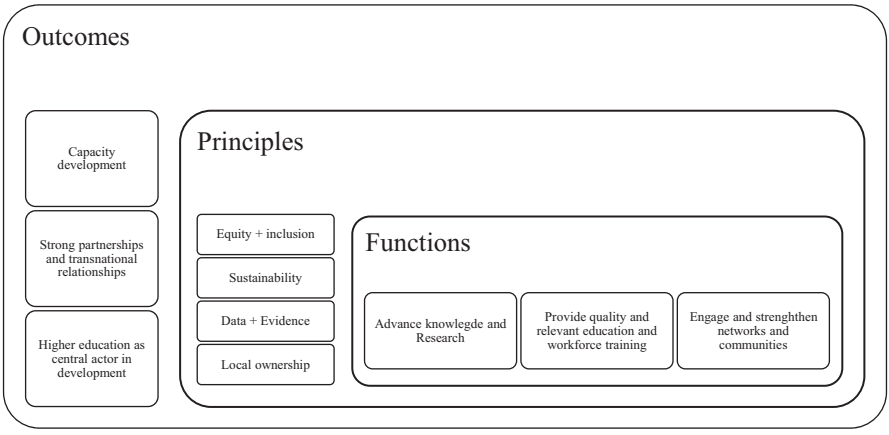

Fig. 1.1 US higher education program framework. (Source: Authors, based on USAID, 2021, p. 1)

- High-quality educational experience and cost-efficient accountability articulate a sustainable quality assurance system and regional economic competitiveness.

These public policy issues demand university managers' entrepreneurial abilities to identify alternatives that incentivize public–private investments in higher education to help low-income families (university entrepreneurial and sustainability capabilities). Likewise, we observe that the link between the higher education PPA and the university missions promotes the university managers' abilities to allocate resources to foster entrepreneurial, innovative, and sustainable capabilities (Teece, 2018; Heaton et al., 2022). It has reinforced the pre-existing university capabilities (entrepreneurial, innovative, and sustainable) as well as the emergence of new ones (digital). Indeed, at the public policy and management collective, according to the Public Policy Division of the (NASPA, 2021), the United States higher education PPA from 2021 to 2024 should have direct focus on the following critical themes:

- Advancing students learning and success by reinforcing postsecondary education, providing them assistance (educational, wellness) and skills development.
- Opening pathways for equity, inclusion, and social justice.
- Reinforcing research, analysis, and scholarships for public policy development.
- Reinforcing professional development and engagement for future public policy issues.

In sum, the United States higher education public policy has provoked the updating/re-building of university capabilities (entrepreneurial, innovative, sustainable, and digital), as well as has highlighted the need for entrepreneurial and innovative abilities for public university managers. Therefore, new organizational justice and responsibility models should be considered in managing science, technology and innovation (Aguilera et al., 2022; Siegel 2022; Waldman et al., 2022). Consequently, universities will contribute to the develop, commercialize, and generate spillovers due to innovations and technologies.

1.2.2 The United Kingdom

In the United Kingdom, higher education public policy-related innovation and technology have been mostly oriented toward reinforcing performance-based research university funding systems (Sivertsen, 2017). In the 1980s, the Thatcher government implemented the Research Assessment Exercise (RAE), based on a peer-review system, to assess research quality and funding allocation. For over 20 years, the higher education public policy based the funding bodies in England, Scotland, Wales, and Northern Ireland to distribute funds of about £2 billion per year, selectively based on the assessed research quality and university efficiency (Sivertsen, 2017). Consequently, university leaders reconducted strategic decisions to react to emerging stakeholders' priorities/needs. During this time, these public policies

reinforced teaching and research missions that demanded university innovation capabilities (Audretsch et al., 2022a, b; Audretsch et al., 2023).

In 2014, the RAE was replaced by the UK Research Excellence Framework (REF), which combined performance-based institutional funding and research evaluation. It evidences the need for new university managers' entrepreneurial and innovative abilities to efficiently allocate resources that generate university outcomes that significantly contribute to economic prosperity, national well-being, and the dissemination of knowledge (REF, 2014). In particular, the REF 2014 supported equality and diversity by applying a code of practice on the transparent equality impact assessment (REF, 2015). While the outputs included the originality, significance, and rigor of academic publications, the impact considered the reach and significance of change or benefit to the economy, society, culture, public policy or services, health, the environment, or quality of life beyond academia (see Fig. 1.2). As a result, new university capabilities were needed for ensuring research scholarly impacts related to entrepreneurship, innovation, and sustainability.

Most recently, the higher education policy has also been influenced by the exit of the United Kingdom from the European Union (Conlon et al., 2021) and due to the COVID-19 disruptions. In this regard, the Higher Education Policy Institute (HEPI) started an interesting conversation about the projection of higher education in England to 2035 (Hewitt, 2021). According to this report, one of the main relevant challenges generated by the recession caused from the pandemic was increasing the disadvantage gap of certain collectives to enter higher education. Due to the radical impact of the COVID-19 pandemic in higher education (UUK, 2022), the current UK higher education public policy should focus on shaping development by

- Ensuring sustainable university funding.
- Protecting students via legislation.

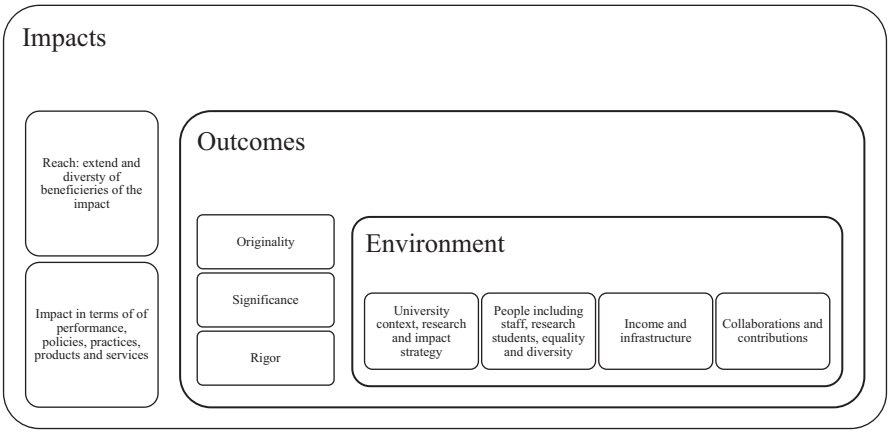

Fig. 1.2 UK research excellence framework. (Source: Authors, based on REF, 2014, 2015)

- Providing high workforce skills, enhancing the value and progress on tackling inflation, and ensuring research, innovation, and business.

In sum, the UK higher education public policy has promoted the quality of education, the effectiveness in resource allocation, and scholarly impacts in the society (Audretsch et al., 2022b). These elements have been strongly needed to update/re-build university capabilities (entrepreneurial, innovative, sustainable, and digital). As a result, the UK policy trend has highlighted the need for reinforcing entrepreneurial and innovative capabilities for university managers to lead the development, commercialization, and spillover effects of university innovations and technologies.

1.2.3 The European Union

After the Second World War, knowledge, technologies, and globalization played a critical role in the education approach. In the European Union (EU) context, the goal was to maintaining collaboration and integration among the members of the union within the framework of common cultural values.

In the 1980s, higher education policy focuses on increasing the quality and efficiency of education and learning at all stages of life of the EU member states (Cankaya et al., 2015). In the 1990s, several higher education reforms were introduced (Sorbonne Declaration, Lisbon Declaration, and Bologna Declaration), looking to establish a competitive European Higher Education Area (EHEA) and a social model focused on cooperation and harmonization that reinforced freedom, equality, and skills (Cankaya et al., 2015; Moser et al., 2022). In the 2000s, higher education experimented with a consolidation period focused on five areas: quality, access, contents, openness, and efficiency (Cankaya et al., 2015). These agreements were configured through different declarations hosted in Prague, Berlin, Bergen, London, and Leuven.

Over the last three decades, the EU authorities from member states implemented the EHEA based on higher education public policy initiative oriented to improving high-quality education by continuing homologation/joint educational programs (Bologna, European Joint Degrees), increasing student mobility (Erasmus), employability, study structures, and attractiveness. In parallel, higher education reforms are pursuing the vision of a unified European Research Area (ERA), open to the whole world and allowing the free transfer of researchers, scientific knowledge, and technologies (Moser et al., 2022). For instance, the European Political Strategy Centre recognized several higher education trends to be considered by the member states' higher education systems (European Commission, 2019, pp. 4–9):

- Investing in early childhood education skills due to the highest rate of social and economic return in higher education.
- Demands for competencies keep evolving and investing in lifelong learning. Therefore, graduation is not the end of learning.

- Digital skills are becoming a core literacy and young people are at an advance and outperform older ones on digital problem-solving. Therefore, reduce the gap in digital literacy among generational cohorts.
- Humans are just some of the ones learning where digital technologies and machines are novel higher educational insights.
- From standardization to customization, by personalizing classroom learning based on job learning requests.
- Growing global competition for universities represents a time to reinvent them.

Directly or indirectly, university managers experimented with the internal transformation toward becoming more innovative and entrepreneurial organizations. Due to these transformation challenges, Fig. 1.3 shows the European Commission initiatives to facilitate organizational change and enhance universities' innovative, entrepreneurial, and digital capabilities (Volungeviciene et al., 2021).

After external shakeouts (2008 financial crises and the COVID-19 pandemic), the EU cooperates with higher education systems and the EU member states to take advantage of smart specializations (European University Association, 2018; Ibáñez et al., 2022) and enable the higher education sector to adapt to changing conditions, to thieve, and to contribute to Europe's resilience and recovery (European Union, 2021). Due to the external shakeouts (climate crisis, democratic-political pressures, social disparities, pandemics), according to the European University Association (2021), the future European universities should be more transformative, sustainable,

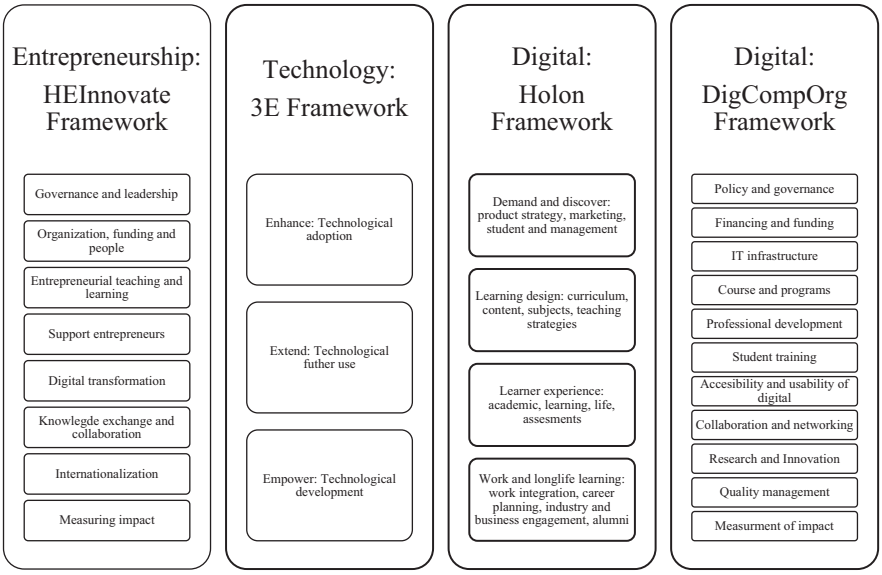

Fig. 1.3 European higher education frameworks. (Source: Authors, based on Volungeviciene et al., 2021)

diverse, and engaged across teaching-learning, research, innovation, and social engagement.

In this way, the EU is looking to recognize the innovative and entrepreneurial capacity building done by the universities across the state members in the last decades and to shape new ones to overcome societal needs, such as sustainability and digital. In sum, the EU higher education public policy has enriched values and capabilities across universities' managers allocated in all state members, becoming more entrepreneurial, innovative, digital, and sustainable.

1.3 Higher Education Public Policy and University Capabilities

1.3.1 Re-building University Capabilities Due to Public Policy Agendas

Table 1.1 shows the interplay between the higher education public policy agenda and the universities' capabilities to achieve the teaching, research, and social engagement missions across the higher education systems in the United States, the United Kingdom, the European Union countries, and the OECD countries. Concretely, higher education public policy has evolved universities' capabilities from innovative to entrepreneurial and sustainable. Indeed, due to the COVID-19 pandemic, we are observing some insights about enhancing the university's digitalization transformation.

The result has been evident in multiple inventions, discoveries, and socioeconomic returns to society (Magda & Buban, 2018). Even the similar/different transformational patterns across higher education systems, there is evident the need for understanding the role of university managers in the effective allocation of resources for achieving the university missions, as well as the university capabilities acquired/developed along transformational processes (Audretsch et al., 2022a; Heaton et al., 2022).

For instance, with some exceptions (the UK system), it is clear that the most common criteria to measure universities' contributions to public policy agendas are still the number/impact of research publications and patents (Audretsch et al., 2022b; Audretsch et al., 2023). A big pending issue is reducing a strong disconnection among university public policy, university funding, university outcomes, university promotion criteria, higher education evaluation protocols, and associations of programs' accreditation (Siegel & Guerrero, 2021).

Table 1.1 Higher education public policy and demand of university capabilities

Associations	Public policy agenda	Demand for new capabilities	Missions	Country
AASCU (2022)	Access, affordability, and value Learning environment Quality, accountability and outcomes	Innovative Entrepreneurial Sustainable	Teaching Research Social engagement	United States
NASPA (2021)	Advocacy for students success Equity, inclusion and social justice Research and scholarship Professional development and engagement	Innovative Sustainable	Teaching Research Social engagement	United States
USAID (2021)	Advance knowledge and research Provide quality and relevant education for workforce Engage and strengthen networks and communities	Innovative Sustainable	Teaching Research Social engagement	United States
REF (2014)	High-quality research Scholarly impacts in multiple areas	Entrepreneurial Innovative Sustainable	Research Social engagement	United Kingdom
UUK (2022)	High-skilled workforce Reduce inequality Sustainable funding Enhancing value for students Tacking grade inflation and big societal challenges Ensuring research and innovation Securing an effective regulatory environment Social recovery post pandemic	Entrepreneurial Innovative Sustainable	Teaching Research Social engagement	United Kingdom
European Union (2021)	Smart specialization Micro-credentials Mobility Resilience, recovery Digitalization and AI Sustainable	Entrepreneurial Innovative Sustainable	Teaching Research Social engagement	European Union

Source: Authors

1.3.2 *University Capabilities Metrics Due to Public Policy Demands*

Public policy's influence on universities has demanded establishing metrics that primarily evidence the university's outcomes derived from the stakeholders' pressures for updating university missions and capabilities. A good example of it

Table 1.2 Demand of university capabilities and university ranking proxies

University ranking	Criteria	Demand for new capabilities	Missions	Sources of information
Innovative University by Reuters (2019)	Patent volume, success Global patents Patent citations Industry article citations % industry collaborative articles Total web of science core papers	Innovative Entrepreneurial	Research Technology Transfer and commercialization	InCites, WOS, Derwent Innovation Index, Derwent Patent Index, Patent Citation Index
Shanghai Ranking by ARWU (2022)	Quality of education Quality of faculty Research output Per capita performance	Innovative Entrepreneurial	Teaching Research	Nobel Prize, Field Medals, Highly Cited Researchers by Clarivate
Times Higher Education by THE (2022a, b)	Teaching Research Citations International outcome Industry income SDGs	Innovative Entrepreneurial Sustainable	Teaching Research Entrepreneurship Social engagement	Academic reputation survey, Elsevier's Scopus dataset
QS University Ranking by QS Quacquarelli Symonds (2022a, b)	Academic reputation Employer reputation Citations International Research Network Employment outcomes Environmental impact Social impact	Teaching Innovative Sustainable	Teaching Research Social engagement	Academic Surveys, Employers survey

Source: Author

evidences the methodologies implemented by the most used university rankings (U.S. News, 2022; QS Quacquarelli Symonds, 2022a, b; THE, 2022a, b; Reuters, 2019; ARWU, 2022) by public policy agents, university managers, and university stakeholders. Table 1.2 shows the adoption of proxies that capture how universities had impregnated an innovative, entrepreneurial, and sustainable orientation in their missions: teaching, research, and social engagement.

Directly or indirectly, university rankings are globally legitimizing the university's contribution to the public policy agenda objectives and building the university's reputation. Particularly, university rankings are capturing some proxies of innovation and technological contributions via patents (Reuters, 2019), research outputs (ARWU, 2022), industrial collaborations, and the income derived from these collaborations (THE, 2022a, b), as well as international networks (QS Quacquarelli Symonds, 2022a, b). It has been used by university managers as a benchmarking analysis for improving their strategic approaches and reinforcing the development of capabilities (Magda & Buban, 2018).

1.4 The Emergence of Higher Education Models

The analysis of the higher education sector also matters to understand the evolution of university models, the market trends, and the pending new scenarios (Alexander, 2020). Figure 1.4 shows the different university models that have emerged due to the influence of public policy frameworks.

Worldwide governmental agencies have recognized the "Innovative University" and the "Entrepreneurial University" models (NACIE, 2011; USAID, 2021; HEInnovate, 2022). Before the COVID-19 pandemic, the Deloitte Center for Higher

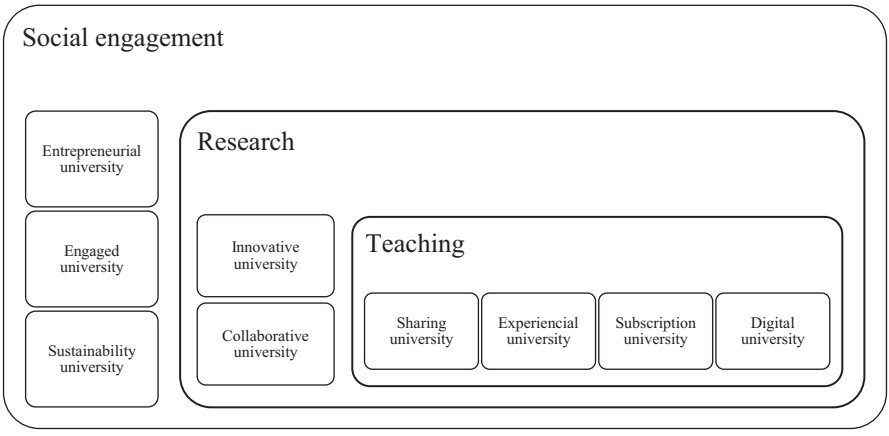

Fig. 1.4 University models derived from public policy. (Source: Authors)

Education Excellence, in conjunction with Georgia Tech's Center for twenty-first Century Universities, presented the higher education sector trends (Deloitte, 2018). According to this report, since the beginning of the 2008 Recession, the public higher education sector has faced an unprecedented set of external forces and pressures that have, in some extreme cases, threatened the very existence of certain types of universities (Deloitte, 2018, p. 3). For example,

- The "Sharing University" focuses on efficiently linking students and administrative services to scale/capitalize on organizations' expertise.
- The "Entrepreneurial University" focused on offerings educational investments based on student and state economic needs.
- The "Experiential University" focuses on integrating work experiences deeply into the curriculum, with students toggling between long stretches in the classroom and the work world related to their study area.
- The "Subscription University" focused on reimagining education as a platform for continual learning that provides students with multiple opportunities to develop both soft and critical technical skills.
- The "Partnership University" focused on making it easier for strategic investments and funding collaboration and consolidation, and also private fundraising.

After the COVID-19 pandemic, UNESCO, OECD, and Inter-American Development Bank elaborated on several diagnoses that evidenced embryonic transformations in higher education models. For example,

- The incipient worldwide digital transformation across higher education systems revealed that digital technologies capabilities are demanding the "Digital University" model (OECD, 2021).
- The evidence shows insufficient attention to reducing inequalities across human resources and disadvantaged students, the constant reduction in the allocation of public funds, and the lack of diversity in the university strategies (Inter-American Development Bank, 2021). It has increased the sustainability demand within universities and the emergence of the "Sustainability University" model (OECD, 2021; Golden et al., 2021).
- The public awareness and commitment to mitigate and rapid innovative responses to societal needs reinforce the idea of the "Engagement University" (OECD, 2021).

The emergence of "university models" was undoubtedly influenced by the transformation of higher education public policy agendas and market pressures in the last few years. In the North America context, the model of "new American University" (Crow & Dabars, 2015) has been incorporated for supporting "public interest technologies" related to the application of technology expertise that generates public benefits and promotes the public good.

1.5 Conclusions

Due to higher education public policy and stakeholders' pressures, universities and their governance structures should become entrepreneurial ambidextrous organizations (Guerrero, 2021; Heaton et al., 2022). It has also demanded new organizational justice and responsibility models for managing science, technology and innovation (Aguilera et al., 2022; Siegel 2022; Waldman et al., 2022). Looking to the future, the higher education public policy agendas are concentrated in the fourth gaps identified by industry, university stakeholders and non-profit organizations (see Ford Foundation, 2022; Bull, 2022; Bouchrika, 2022). First, *regarding sustainability trends*, universities are tasked with enhancing gender/racial diversity, reducing workforce-opportunity gaps, and paying attention to mental health awareness. Second, *regarding technological trends*, universities are demanded to be equipped with multiple skills, including artificial intelligence, hybrid learning environments, and technical skill gaps in the curriculum. Third, *regarding governance trends*, universities face a changing pathway for fundraising due to the heavy reliant on public funding, as well as the growing need for alternative funding options. Fourth, *regarding public interest technologies*, universities face a challenging pathways for applying technology expertise to generate public benefits. Consequently, multiple capabilities within the university governance, missions, and outcomes are needed to achieve current/future higher educational sectoral trends.

References

AASCU. (2022). *Public policy agenda*. https://www.aascu.org/policy/

Aguilera, R. V., Waldman, D. A., & Siegel, D. S. (2022). Responsibility and organization science: integrating micro and macro perspectives. *Organization Science, 33*(1), 483–494.

Alexander, B. (2020). *Academia next: The futures of higher education*. Johns Hopkins University Press.

ARWU. (2022). *Shanghai ranking's academic ranking of the World Universities methodology 2022*. https://www.shanghairanking.com/methodology/arwu/2022

Audretsch, D., Belitski, M., & Guerrero, M. (2022a). Seizing spin-offs' and parent universities' resources and capabilities: An intertemporal resilience. In *Academy of management proceedings* (Vol. 2022, No. 1, p. 12882). Academy of Management.

Audretsch, D. B., Belitski, M., Guerrero, M., & Siegel, D. S. (2022b). Assessing the impact of the UK's Research Excellence Framework on the relationship between university scholarly output and education and regional economic growth. *Academy of Management Learning & Education, 21*(3), 394–421.

Audretsch, D. B., Belitski, M., & Guerrero, M. (2023). Sustainable orientation management and institutional quality: looking into European entrepreneurial innovation ecosystems. *Technovation, 124*, 102742.

Bouchrika, I. (2022). *11 top trends in higher education: 2021/2022 data, insights & predictions*. https://research.com/education/trends-in-higher-education

Bull, L. (2022). *Are universities back to doing more with less?* https://wonkhe.com/blogs/are-universities-back-to-doing-more-with-less/

Cankaya, S., Kutlu, Ö., & Cebeci, E. (2015). The educational policy of European Union. *Procedia-Social and Behavioral Sciences, 174*, 886–893.

Conlon, G., Lader, R., Halterbeck, M., & Hedges, S. (2021, February). *EU exit: Estimating the impact on UK higher education: Research report*.

Crow, M. M., & Dabars, W. B. (2015). *Designing the new American university.* Johns Hopkins University Press.

Crow, M. M., Whitman, K., & Anderson, D. M. (2020). Rethinking academic entrepreneurship: University governance and the emergence of the academic enterprise. *Public Administration Review, 80*(3), 511–515.

Dabić, M., Švarc, J., & González-Loureiro, M. (2016). Antecedents of entrepreneurial universities: From the first industrial revolution to knowledge economy. In *Entrepreneurial universities in innovation-seeking countries* (pp. 47–63). Palgrave Macmillan.

Dabić, M., Vlačić, B., Guerrero, M., & Daim, T. U. (2022). University spin-offs: The past, the present, and the future. *Studies in Higher Education*, 1–15. https://doi.org/10.1080/03075079.2022.2122656

Deloitte. (2018). *The future(s) of public higher education How state universities can survive—and thrive—in a new era*. Deloitte Center for Higher Education Excellence and Georgia Tech's Center for 21st Century Universities. www2.deloitte.com/content/dam/insights/us/articles/4726_future-of-higher-education/DI_Future-of-public-higher-ed.pdf

European Commission. (2019). *10 trends transforming education as we know it*. European Political Strategy Center. https://op.europa.eu/en/publication-detail/-/publication/227c6186-10d0-11ea-8c1f-01aa75ed71a1

European Union. (2021). *Higher education initiatives*. European Union. https://education.ec.europa.eu/education-levels/higher-education/about-higher-education

European University Association. (2018). *Coherent policies for Europe beyond 2020. Maximizing the effectiveness of smart specialization for regional development*. https://eua.eu/downloads/publications/coherent%20policies%20for%20europe%20beyond%202020%20maximising%20the%20effectiveness%20of%20smart%20specialisation%20strategies.pdf

European University Association. (2021). *Universities without walls. A vision for 2030*. https://eua.eu/resources/publications/957:universities-without-walls-%E2%80%93-eua%E2%80%99s-vision-for-europe%E2%80%99s-universities-in-2030.html

Ford Foundation (2022). *Public interest technology and its origins*. Ford Foundation Strategy. https://www.fordfoundation.org/work/challenging-inequality/technology-and-society/public-interest-technology-and-its-origins/

Golden, G., Troy, L., & Weko, T. (2021). *How are higher education systems in OECD countries resourced?: Evidence from an OECD policy survey* (OECD education working papers, no. 259). OECD Publishing. https://doi.org/10.1787/0ac1fbad-en

Gores, T., & Link, A. N. (2021). The globalization of the Bayh–Dole Act. *Annals of Science and Technology Policy, 5*(1), 1–90.

Guerrero, M. (2021). Ambidexterity and entrepreneurship studies: A literature review and research agenda. *Foundations and Trends® in Entrepreneurship, 17*(5–6), 436–650.

Guerrero, M., & Urbano, D. (2019). Effectiveness of technology transfer policies and legislation in fostering entrepreneurial innovations across continents: An overview. *The Journal of Technology Transfer, 44*(5), 1347–1366.

Guerrero, M., & Urbano, D. (2021a). The entrepreneurial university in the digital era: Looking into teaching challenges and new higher education trends. In *A research agenda for the entrepreneurial university*. Edward Elgar Publishing.

Guerrero, M., & Urbano, D. (2021b). *Technology transfer and entrepreneurial innovations*. Springer.

Heaton, S., Teece, D., & Agronin, E. (2022). Dynamic capabilities and governance: An empirical investigation of financial performance of the higher education sector. *Strategic Management Journal*.

HEInnovate. (2022). *HEInnovate: Initiative of the European Commission's DG Education and Culture in partnership with the OECD*. https://www.heinnovate.eu

Hewitt, R. (2021). *Demand for higher education to 2035*. HEPI Report 134. https://www.hepi.ac.uk/wp-content/uploads/2020/10/Demand-for-Higher-Education-to-2035_HEPI-Report-134_FINAL.pdf

Ibáñez, M. J., Guerrero, M., Yáñez-Valdés, C., & Barros-Celume, S. (2022). Digital social entrepreneurship: The N-Helix response to stakeholders' COVID-19 needs. *Journal of Technology Transfer, 47*(2), 556–579.

Inter-American Development Bank. (2021). *Higher education digital transformation in Latin America and the Caribbean*. IDB. https://doi.org/10.18235/0003829

John, E. P. S., Daun-Barnett, N., & Moronski-Chapman, K. M. (2018). *Public policy and higher education: Reframing strategies for preparation, access, and college success*. Routledge.

Magda, A. J., & Buban, J. (2018). *The state of innovation in higher education: A survey of academic administrators*. The Learning House.

Moser, P., Feiel, S., & Kircher, V. (2022). The (R)Evolution of European education policy: European higher education alliances. *BHM Berg-und Hüttenmännische Monatshefte, 167*(10), 457–461.

NACIE. (2011). *The innovative and entrepreneurial university: Higher education, innovation and entrepreneurship focus*. National Advisory Council on Innovation and Entrepreneurship. https://www.eda.gov/pdf/the_innovative_and_entrepreneurial_university_report.pdf

NASPA. (2021). *2021–2024 public policy agenda*. NASPA, Public Policy Division. https://www.naspa.org/policypapers/2021-2024-public-policy-agenda

OECD. (2021). *The state of higher education: One year into the COVID-19 pandemic*. OECD Publishing. https://doi.org/10.1787/83c41957-en

Phan, P. H., & Siegel, D. S. (2006). The effectiveness of university technology transfer. *Foundations and Trends® in Entrepreneurship, 2*(2), 77–144.

QS Quacquarelli Symonds. (2022a). *QS World University Rankings methodology: Using rankings to start your university search*. https://www.topuniversities.com/qs-world-university-rankings/methodology

QS Quacquarelli Symonds. (2022b). *QS World University Rankings: Sustainability methodology*. https://www.topuniversities.com/university-rankings/sustainability-rankings/methodology

REF. (2014). *Research excellence framework policy in UK*. Retrieved from https://ref.ac.uk/2014/about/

REF. (2015). *REF 2014: Brief guide and key facts*. HEFCE. Retrieved from https://ref.ac.uk/2014/media/ref/content/pub/REF%20Brief%20Guide%202014.pdf

Reuters. (2019). *Europe's most innovative universities 2019*. https://www.reuters.com/graphics/europe-universities-innovation/010091n72j7/index.html

Siegel, D. S. (2022). Two Cheers for RRBM, Pasteur's Quadrant, and an Application of RRBM to the Commercialization of Science and Technology Transfer. *Journal of Management Studies, 59*(6), 1643–1650.

Siegel, D. S., & Guerrero, M. (2021). The impact of quarantines, lockdowns, and 'reopenings' on the commercialization of science: Micro and macro issues. *Journal of Management Studies, 58*(5), 1389–1394.

Siegel, D. S., & Phan, P. H. (2005). Analyzing the effectiveness of university technology transfer: Implications for entrepreneurship education. In *University entrepreneurship and technology transfer*. Emerald Group Publishing Limited.

Sivertsen, G. (2017). Unique, but still best practice? The Research Excellence Framework (REF) from an international perspective. *Palgrave Communications, 3*(1), 1–6.

Teece, D. J. (2018). Managing the university: Why "organized anarchy" is unacceptable in the age of massive open online courses. *Strategic Organization, 16*(1), 92–102.

THE. (2022a). *Impact rankings 2022: Methodology*. https://www.timeshighereducation.com/world-university-rankings/impact-rankings-2022-methodology

THE. (2022b). *World University Rankings 2023: Methodology*. https://www.timeshighereducation.com/world-university-rankings/world-university-rankings-2023-methodology

U.S. News. (2022). *Most innovative school methodology*. https://www.usnews.com/education/best-colleges/articles/most-innovative-schools-methodology

USAID. (2021). *Higher education as a central actor in self-reliant development: A program framework*. Center for Education.

UUK. (2022). *Policy: An overview*. https://www.universitiesuk.ac.uk/what-we-do/policy-and-research/policy-overview

Volungeviciene, A., Brown, M., Greenspon, R., Gaebel, M., & Morrisroe, A. (2021). *Developing a high performance digital education ecosystem: Institutional self-assessment instruments*. European University Association.

Waldman, D. A., Vaulont, M. J., Balven, R. M., Siegel, D. S., & Rupp, D. E. (2022). The role of justice perceptions in formal and informal university technology transfer. *Journal of Applied Psychology, 107*(8), 1397.