Handbook, Database, Cloud

Regimes of Observation and the Infrastructural Making of Universities

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Abstract

How do we come to know organizations? This article traces the infrastructures through which universities have been rendered observable since the late nineteenth century, from printed handbooks to databases to commercial cloud platforms. Drawing on archival records, documentary sources, and interviews, it identifies three *regimes of observation*—recognitive, commensurative, and extractivist—each coupling a technology, an abstraction of the university as an object of knowledge, and a distinct configuration of cross-community coordination. These regimes do not replace one another but sediment: earlier arrangements persist as substrates that shape what newer infrastructures can render visible, comparable, and actionable. The article thus shifts attention from what observation infrastructures reveal about organizations to how these infrastructures are historically assembled, how they coexist in the present, and how they shape the possibilities and politics of knowing organizations.

1. Introduction

At the turn of the seventeenth century, George Abbot, master of University College at Oxford, published *A Briefe Description of the whole Worlde*, a geographical account of the world as known in his day. As the subtitle of its third edition reveals, the book covered the world's "Monarchies, Empires and Kingdomes of the same, with their Academies."[1] Apart from a few passing remarks, the academies were mostly left for the very end of the book—a mere two pages listing seventy-six universities under their respective kingdoms, with geographic coordinates alongside most entries.

For all intents and purposes, Abbot's *Briefe Description* was "a rather dull and ordinary geography textbook" (Cormack 1997, 84n138). It belonged, however, to a popular genre in early modern Europe, that of cosmography. In the wake of the discoveries of the New World, cosmography blended theological, political, and scientific ideas into "a new politic of global sizing" (Mitterle 2022, 471), advancing the idea of the world as a "singular entity […] eminently knowable and navigable" (Young 2023, 231). Within Abbot's cosmographic projection of the world, universities emerged as a distinct class of world objects whose members could be known, located, and compared alongside kingdoms, rivers, and cities.

From Abbot's printed list to today's digital dashboards, efforts to make universities knowable and comparable have persisted, even as the means of producing this knowledge have changed. Yet scholarship on how knowledge about organizations is produced has paid little attention to the historical evolution of sociomaterial infrastructures that enable it, focusing instead on the most recent practices and technologies. In the absence of such research, new infrastructures appear as incremental technological improvements rather than as distinct ways of organizing

[1] Abbot, George. 1608. *A Briefe Description of the whole Worlde*. 3rd ed. Accessed October 30, 2026. http://archive.org/details/briefedescriptio00abbo. The first edition (1599) did not include the list of universities, but contained passing remarks on some of them in its descriptions of individual countries.

the production of knowledge about organizations. Universities are a case in point, and the one this article takes up.[2]

To bring this history into view, the present article focuses on the conditions that have made and continue to make observation possible, but which have remained largely in the background of research, evaluation practices, and policy debates, implicitly shaping them while themselves evading scrutiny. It starts from the assumption that knowledge presupposes practices of observation: organizations can only be constituted as objects of knowledge once they are rendered observable through practices such as description, classification, and comparison. Rather than taking these practices and the sociomaterial infrastructures through which they are organized as given, the article asks how they have changed over time and how these changes have shaped what could become known about a specific class of organizations.

The article proposes the concept of *regimes of observation*, introduced in the next section. Drawing on archival records, documentary sources, and interviews, it then reconstructs the historical emergence of three regimes through which universities are made observable: recognitive, commensurative, and extractivist. By comparing these regimes along their constitutive dimensions, the article argues that they sediment rather than succeed one another, with earlier technologies, abstractions, and coordinating logics persisting within later ones. The article closes by considering the broader implications for the sociology of organizations and the politics of observation.

2. Observation as an infrastructural accomplishment

The conceptual framework proposed here rests on the following claim: organizations do not simply exist as objects of knowledge but must be actively produced as such through historically situated practices of observation and recording. These practices

[2] I use "organization" here in an analytical rather than strictly historical sense. I do not imply that universities in earlier periods were constituted as organizations in the sense of Meyer and Bromley (2013). Krücken and Meier (2006) argued that universities' emergence as "organizational actors" was itself driven in part by processes of observation and comparison, rankings prominent among them, suggesting that the infrastructures examined in this article may be not merely applied to universities as organizations, but also constitutive of that status.

depend on sociomaterial infrastructures that organize visibility, comparability, and coordination, rather than residing in the minds of observers alone. Instead of treating observation as an abstract epistemic stance or as episodic acts of description, this article approaches it as an infrastructural accomplishment: something made possible through the uptake and repeated use of specific technologies.[3] A technology alone, however, does not amount to an infrastructure; infrastructure is "fundamentally and always a *relation*, never a thing" (Star and Ruhleder 1994, 253). Observation becomes infrastructural only when representations are coupled to established practices that require regular updating, circulation, and mobilization.

Different strands of scholarship have examined how organizations become knowable through sociomaterial infrastructures. Science and technology studies (STS) has long shown how information systems classify, sort, and standardize what they represent (Bowker and Star 1999), an approach more recently extended to the platforms that now organize much of digital life (Plantin et al. 2018), typically through close attention to a single infrastructure or system at a time. Organizational sociology, including world-society approaches, has theorized why organizations converge on legitimated, comparable forms once they are observed and evaluated by external audiences (DiMaggio and Powell 1983; Meyer and Bromley 2013), often treating the technology of observation itself as a stable backdrop. The sociology of quantification, finally, has examined how commensuration and calculation reshape what is seen, valued, and acted upon (Espeland and Stevens 2008), while scholars in this tradition have called for closer attention to how different quantification regimes interact (Mennicken and Espeland 2019).

The concept of regimes of observation builds on these literatures while departing from each in important respects. Rather than holding the observing technology constant, or treating quantification regimes as discrete objects of comparison, it treats the technology of observation and the relations of coordination it enables as jointly variable over historical time, layered rather than merely successive. What counts as an organization of a particular kind (a university, for instance), or how it is observed,

[3] I use "technology" to broadly denote any stable material arrangement that mediates observation and shapes what can be known, including the historically contingent ways in which information storage technologies structure what is recorded and how (Bowker and Star 1999).

changes together with the technologies that render it observable. Moreover, how observation is coordinated across heterogeneous communities is never settled once and for all but is contested, renegotiated, and layered anew as new technologies emerge. It is this coupling of technological and relational change over time, rather than either alone, that the concept of regimes of observation is meant to capture.

A regime of observation is not limited to one institutional sphere or community. It is a cross-community achievement: not a natural byproduct of technological capacity, but an ongoing, effortful accomplishment of coordination among parties who need not share goals, interests, or even a common understanding of what is being observed and why. This coordination is sustained through a *boundary infrastructure* (Bowker and Star 1999)—a sociotechnical arrangement that underpins the regime by enabling heterogeneous communities to coordinate without requiring prior consensus. Boundary infrastructures work by allowing different groups to rely on the same representations while assigning them different meanings and putting them to different uses. Their stability thus lies not in shared interpretations but in the continued circulation of common representations. A repeatedly conducted population census illustrates this point: statisticians, policymakers, and researchers coordinate around the same categories and counts while using and interpreting them differently.

Infrastructures, however, are rarely self-contained. They tend to spread, overlap, and accumulate over time, with older arrangements continuing to shape practices even as new ones are introduced (Star 1999). Boundary infrastructures are therefore not simply replaced but *layered*: earlier ways of observing do not necessarily disappear when new technologies emerge but may become embedded as a taken-for-granted substratum that shapes how new technologies are deployed. Layering, in this sense, differs from the concept of convergence in media studies, which describes the coming together of previously distinct media technologies, industries, and platforms (Jenkins 2006). It encompasses not only the technical embedding of one system within another but also the persistence of categories and rationales across technological arrangements. To continue with the census analogy, contemporary population censuses rely on digital databases and data management software, yet they still work with inherited categories, territorial divisions, and counting conventions that predate these technologies (Desrosières 1998; Scott 1999).

Boundary infrastructures are thus never finished but continually renegotiated as new communities, technologies, and purposes meet inherited arrangements (Bowker and Star 1999).

This layered character of infrastructure calls for a temporal perspective capable of holding multiple historical strata simultaneously. Here, Koselleck's (1985, 2018) *layered conception of historical time* is particularly instructive. Rather than treating the present as temporally homogeneous, Koselleck argues that it is composed of historical strata originating in different periods and persisting into the present. This suggests that infrastructures such as the census comprise layers that are renewed on different timescales: some elements, such as questionnaires or reporting procedures, are revised regularly, while others, such as classificatory schemes, territorial units, or assumptions about who counts, persist across successive census rounds and technological systems, delimiting what can be observed in the first place. The resulting infrastructure is therefore not temporally uniform but an accumulation of historical layers, each carrying forward elements of the arrangements from which it emerged.

If infrastructures sediment, they also sediment judgments about relevance and legitimacy, stabilizing particular abstractions of the social world. In the case of the population census, long-standing classificatory schemes are anchored in specific abstractions of the human subject, including the figure of the citizen. These abstractions determine not only how people are counted but also who is counted and which individual characteristics are deemed worth observing (Loveman and Muniz 2007). As these judgments and abstractions become embedded in routines and technologies, they produce demographic identities that become objectified and ultimately naturalized, shaping not only what becomes visible or invisible but also what comes to count as an objective demographic fact (Kreager 2004).

This process of making some aspects of the social world visible while rendering others invisible is central to Brighenti's (2007, 2010) work on the *politics of visibility*. Visibility constitutes a field of relations of perception and power. Regimes of observation thus function not only as sociotechnical arrangements for producing information but also as normative and political formations. They shape what can appear as relevant at particular historical moments. This field is not reducible to any

single act of seeing or being seen; rather, it is shaped through ongoing decisions about what is worth being seen, by whom, and at what price. As Brighenti (2007) emphasizes, these decisions are never simply technical but always practical and political. While Scott's (1999) concept of legibility captures one dimension of this—the state-led rendering of populations and territories readable "from above and outside" (p. 43)—Brighenti's visibility is multidirectional, that is, a field in which actors look in different directions and are observed from many sides. It more broadly denotes the mediated conditions under which certain representations become dominant or consequential across social fields, including science, media, and organizations, rather than exclusively within the state. Individuals whose identities are not "seen" by the census are not merely ungovernable; they are "the unseen, the excluded" (Brighenti 2007, 330).

What, then, are regimes of observation in the case of organizations? I propose the following: A regime of observation is a distinct configuration of (a) a particular information technology, which sets the terms of what can be seen and recorded within a larger boundary infrastructure; (b) a specific abstraction of the class of organizations, produced or stabilized by this technology; and (c) the cross-community relations of coordination through which that technology and abstraction are established, contested, and sustained over time. How regimes of observation emerge, consolidate, and sediment in relation to a specific class of organizations, and with what consequences, is an empirical and historical question to which we now turn.

3. Research materials and analytical approach

This article draws on a larger corpus of primary materials—archival records, documentary sources, and interviews—collected as part of ongoing research on how universities have been made countable and comparable throughout history. The archival component consists of uncatalogued records held at the International Association of Universities (IAU) in Paris, which I accessed with special permission from its permanent Secretariat. The digitized files contain the full available run of Administrative Board meeting minutes (1950–2004) and Secretary General reports (for most years in the same period). Together, they constitute the only continuous

record of the IAU's own information-gathering activities. Minutes typically recorded routine governance business, punctuated by recurring discussion of handbook production—the technology associated with the recognitive regime. To document the same regime, the archival records are complemented by thirty-five editions of different handbooks produced by university representative bodies (1914–2019), other handbooks and reference works consulted for comparison (e.g., the German *Minerva* yearbook), and documents that served as evidence of the reception of handbooks, such as reviews published in journals.

The IAU archive provided some of the primary sources relevant also to the commensurative regime, notably a separately organized sub-collection of some 3,400 pages of correspondence and working documents relating to the TRACE project, documenting the emergence of first international university databases (Section 4.2). For the commensurative and extractivist regimes, the corpus additionally comprises project documentation, product literature, licensing agreements, website screenshots, recordings of conference panels and demonstrations, and secondary sources. I also took part in several user training sessions for EHESO (the European Higher Education Sector Observatory), during which I took extensive notes.

To complement the documentary corpus, I conducted nineteen semi-structured interviews, covering the founding rationale, operation, and reception of different infrastructures. Interviewees fell into three groups, distinguished retrospectively rather than specified in advance as sampling categories: (a) project leaders, developers, and operators of specific infrastructures; (b) higher education researchers knowledgeable about specific infrastructures; and (c) university staff engaging with these infrastructures. Several individuals, however, belonged to more than one group. Some interviewees requested anonymity, while others did not. Since the interviews primarily supplement claims already grounded in the documentary corpus, I do not systematically identify which interviews relate to which infrastructures.

The three regimes and the dimensions along which I compare them were not specified in advance but were drawn through iterative engagement with the materials. The recognitive regime was clearly set apart early on, given the handbook's distinctive material form (a printed book). The distinction between the commensurative and extractivist regimes, on the other hand, emerged more

gradually. Separating a database from a cloud platform thus required attending less to the technology itself than to differences in ownership, commercial rationale, and the direction of visibility between observer and observed.

Finally, the three regimes differ in how accessible their history is to a researcher. The recognitive regime's handbooks survive as physical objects, though the organizational process behind them is recoverable only through their producers' own incomplete records. The commensurative regime's databases are, by comparison, often better documented (although older databases are less well documented than more recent ones). Many of the databases discussed are, or were, public or publicly funded infrastructures that have published reports and technical manuals as a matter of institutional accountability. This documentation is further supplemented by Wayback Machine captures of interfaces and project websites no longer online. The extractivist regime is the most opaque. The companies that operate different platforms publish product literature but not the internal records of how their systems were built, which is consistent with their commercial character. Consequently, the analysis of this regime relies more heavily on publicly accessible sources than on direct access to this particular backstage. Across all three regimes, specific sources are listed in footnotes when a claim is directly quoted or rests on a single identifiable source.

4. Making the world of universities observable

Echoing Abbot's early modern cosmographic writings, the regimes of observation identified here align universities within a wider horizon of knowledge that transcends any single polity or tradition. Each university, wherever it is, is thereby rendered observable as a part of a world-spanning collective. Therefore, identifying and delimiting regimes of observation requires attention to, on the one hand, the historical and socio-political origins and careers of different ways of assembling the "world of universities" and, on the other, the affordances of technologies that make such an assembling possible, in the sense that they enable but do not determine particular configurations of observation (Abend 2022). In what follows, I trace the historical origins and distinctive features of each regime in turn.

4.1 Seeing like a handbook: the recognitive regime[4]

For centuries, information about universities circulated primarily through the printed page. It was, however, only in the late nineteenth century that the *university handbook* emerged as a distinct genre. University handbooks were serially published directories of universities, not designed to be read sequentially but to be consulted episodically in search of specific information. The information under each university entry was rendered as continuous descriptive prose under recurring categories, rather than discrete, tabulated values. In this way, each entry read as a compact institutional account of varying length before the volume moved on to the next university in turn. The handbook's defining affordance, therefore, lay in its ability to stabilize knowledge through a relatively fixed layout and durable inscription on the printed page.

The emergence of the university handbook was a by-product of the internationalism that gathered momentum from the late nineteenth century, a period in which education, science, and culture were increasingly imagined as transnational fields that required a more coordinated approach to the collection and circulation of information (Day 2014). Reference works that inventoried, described, and classified the world proliferated alongside international organizations during this era, advancing the idea that coordination beyond the nation-state was possible, desirable, and dependent on shared systems of knowledge (Sluga 2013; Boli and Thomas 1999). It was within this broader internationalist environment that the first international associations of universities emerged, seeking to promote the alignment of interests, information exchange, and various forms of cooperation (Brankovic 2018).

The earliest such association was founded in London in 1913 as the Universities Bureau of the British Empire, today known as the Association of Commonwealth Universities (ACU). One of the Bureau's main missions was to act as an authoritative source of information on universities within the empire—a task it

[4] The term draws on Brighenti's (2010) relational account of visibility-as-recognition, which is situated within the broader sociological tradition of recognition theory.

pursued through the annual publication of *The Yearbook of the Universities of the Empire*, a reference handbook intended to be:

> … of use both to persons responsible for university organization and to students, especially advanced students, who are looking out for opportunities of study and research. These comparative presentations will, it is hoped, enable the authorities of Universities to see at a glance what is being done elsewhere.[5]

The first edition listed fifty-three universities across the United Kingdom and its dominions and colonies, alphabetically by institution rather than grouped by country, in a volume of more than 600 pages. Each entry was structured around a set of categories, including foundation, degrees conferred, academic calendars, changes in regulations, and teaching staff. The level of detail varied considerably from one entry to the next, though the format offered no way of signaling why, meaning that a brief entry could reflect a small institution, an uncooperative one, or simply one whose materials had not arrived in time for print. Although the volumes do not always disclose how the underlying information was gathered, those that do suggest that the task typically included consulting official university or government publications and drawing on "the ungrudging help afforded by the official Registrars and other correspondents in the Universities."[6]

The ACU *Yearbook* was an early expression of a reference-work format that would reach its peak from 1959 through the mid-1970s, when the ACU, the American Council on Education (ACE), and the International Association of Universities (IAU) began collaborating on their flagship university handbooks, creating the first "world-wide reference series" produced by universities themselves, via their representative

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[5] The reader is invited to inspect the first edition directly, freely available via the Internet Archive: Dawson, W. H., ed. 1914. *Yearbook of the Universities of the Empire*. Robert Jenkins Ltd. Publishers, p. v. Accessed October 30, 2026. http://archive.org/details/commonwealthun1914londuoft.

[6] Dawson, W. H., ed. 1925. *The Yearbook of the Universities of the Empire*. G. Bell and Sons, Ltd., p. vi. Accessed October 30, 2026. http://archive.org/details/in.ernet.dli.2015.73020.

bodies.[7] As early as 1960, the series was recognized well beyond the three organizations. That year, the American Association of University Professors described the three handbooks as comprising "the standard directories of higher education throughout the world"[8]—a pattern echoed in bibliographies and library holdings lists, which would now catalogue the three as a set.

To better grasp the handbook as a technology of observation, we need to examine the kind of visibility it afforded to universities at the height of the ACU–ACE–IAU cooperation—the 1960s. Doing so, however, requires situating the handbook trilogy within a broader documentary landscape. First, these handbooks were not the only efforts to systematically compile information on universities worldwide. When the ACU published its first *Yearbook* in 1914, the German *Minerva: Jahrbuch der gelehrten Welt* had been in circulation since 1891. The French *Index Generalis*, a long-running reference work listing universities and dating to the interwar period, was likewise well established. Yet without the backing of an authoritative institutional body, neither enjoyed the representational legitimacy that the ACU, ACE, and IAU handbooks would come to possess.

Second, the dramatic expansion of higher education after World War II (Frank and Meyer 2020) heightened the value placed on timely and reliable information, particularly about newly established institutions. It was against this backdrop that the ACU, ACE, and IAU presented their handbooks not merely as additional reference works but as a coordinated and qualitatively different alternative—superior even—to existing compilations. Here is how J. F. Foster, Secretary of ACU and editor of its *Yearbook*, envisioned the three handbooks in 1958:

> … all of them of a non-commercial nature, unlike those to which the Chairman had referred [*Minerva*, *Index Generalis*, *The World of Learning*]. All three volumes would thus be products of direct university co-operation,

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[7] "Report of the Director [H. M. R. Keyes], International Universities Bureau for the year 1959 submitted to the Administrative Board," p. 9. IAU archive, Paris, folder: Minutes Admin Board Summary Records Documents 4.

[8] "Educational Developments." 1960. *AAUP Bulletin 46* (1): 129–34, p. 131. https://www.jstor.org/stable/40222763.

> all controlled by academic bodies acting in close consultation with each other. […] the three books should each retain their individuality […] the "family" resemblances strengthened wherever that was possible and found to be of mutual benefit, […] each [gaining] strength from the others.[9]

The opening sections of the early-to-mid 1960s editions of the three handbooks reveal a shared emphasis on factual description, completeness, and documentary reliability, an ambition often difficult to meet in practice. Even though the commitment to worldwide coverage was explicitly stated, the three handbooks would produce an unbalanced representation of the global landscape, reflecting their respective histories, editorial decisions, Cold War geopolitics, but also practical difficulties. Speaking of the launch of the IAU *Handbook* in 1959, H. M. R. Keyes, IAU Secretary General and editor of the handbook, acknowledged that "the collection of information from universities in every corner of the world was a difficult task."[10] Decades later, Franz Eberhard, one of Keyes's successors in the role, would concede that sending out some 10,000 questionnaires for the *Handbook* produced "very poor returns."[11] The imbalance was geographic but also temporal: the three books published new editions at varying intervals—ACU annually, IAU mostly triennially, and ACE quadrennially—making the global view asynchronous by design.

Each handbook operationalized inclusion through distinct institutional proxies for legitimacy. The IAU delegated recognition to responsible national authorities; the ACE anchored inclusion in regional accreditation decisions; and the ACU restricted entry to universities deemed to be "of good standing" (yet without specifying the criteria by which such standing was assessed).[12] Although these mechanisms differed

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[9] "Draft Minutes of the Tenth Meeting of the Administrative Board, at Ste. Marguerite, near Montreal, 9, 10 and 11 September, 1958," p. 8. IAU archive, Paris, folder: Minutes Admin Board Summary Records Documents 4.

[10] "Draft Minutes of the Tenth Meeting of the Administrative Board, at Ste. Marguerite, near Montreal, 9, 10 and 11 September, 1958," p. 7. IAU archive, Paris, folder: Minutes Admin Board Summary Records Documents 4.

[11] "Draft Minutes of the Forty-Sixth Meeting of the Administrative Board, Ouro Preto, Brazil, 9–11 August 1988," p. 20. IAU archive, Paris, folder: 1980–91 Board Minutes.

[12] Foster, J. F., ed. 1962. *Commonwealth Universities Yearbook*. R. & R. Clark, Ltd., p. ix. Accessed October 30, 2026. https://archive.org/details/in.ernet.dli.2015.190083.

in form, they performed essentially the same abstracting operation. They translated heterogeneous national, legal, and organizational arrangements into a single categorical distinction—recognized versus unrecognized—thereby stabilizing an abstract figure of the "university" (or higher education institution, more broadly) as a legitimate member of an international collective. In doing so, the handbooks did not simply describe institutions as they existed locally but actively produced an ostensibly global community of peers. It is this mode of abstraction—grounded in public (peer) acknowledgment—that defines the recognitive regime of observation.

As the number of institutions and the amount of information included in the handbooks grew, their production became increasingly challenging, time-consuming, and costly. Together, the early 1970s editions of the three handbooks listed more than 6,000 institutions and stretched across more than 5,000 pages. Although by far the most modest undertaking in terms of the number of institutions covered, the ACU *Yearbook* was the only one to include a staff directory, which in the 1973 edition counted more than 120,000 names of people working at about 250 universities across the Commonwealth. At the IAU, for example, this "particularly onerous task" involved analyzing responses to thousands of questionnaires as well as "the extraction of information from calendars, catalogues and other official documents in many different languages"[13]—the task "chiefly carried out by one person, Miss Taylor."[14] And while "the regular work of the [IAU] Secretariat was being progressively computerized" from the early 1980s, the task of "placing the contents of the Handbook on computer was an exceedingly complex one" due to "the extremely heterogeneous nature of the information published about the different institutions."[15]

By the end of the 1980s, the limits of the handbook as a technology were increasingly difficult to ignore. Signs of strain had, in fact, already surfaced in the

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[13] "Report of the Secretary-General [D. J. Aitken] 1979," p. 9. IAU archive, Paris, folder: Minutes Admin Board Summary Records Documents 12.

[14] "Draft Minutes of the Thirty-Sixth Meeting of the Administrative Board, Manila, Philippines, 19–21 August 1980," p. 4. IAU archive, Paris, folder: 1980–91 Board Minutes.

[15] "Draft Minutes of the Forty-Fourth Meeting of the Administrative Board, Paris, 26–28 February 1986," p. 14. IAU archive, Paris, folder: 1980–91 Board Minutes.

cooperation between ACU, ACE, and IAU in the mid-1970s, and by the mid-1980s, difficulties had become a recurring topic of concern at IAU Board meetings. By the early 1990s, the IAU had assumed sole responsibility for worldwide coverage, while the ACU and ACE continued publishing their handbooks independently. By 2020, all three handbooks had been discontinued. Importantly, the mounting strains of handbook production coincided with a growing misalignment between its descriptive, slow-paced, recognition-based logic and emerging demands for up-to-date and standardized information that could more readily inform cross-border exchange, policy debates, planning, and management decisions. And the technology needed to meet this demand was already available.

4.2 Seeing like a database: the commensurative regime

If the handbook renders universities visible as members of a community, the database reorganizes observation around relationships among individual units and their comparability. The database, argues Manovich (2001), is the "natural enemy" of the narrative, competing with it "for the same territory of human culture" (p. 199). This contrast becomes especially apparent once we look into the database's material properties. As a technology, or a family of technologies,[16] the database is not designed to accommodate thick descriptions; nor is it meant to present each university as a single, integrated entity. Rather, it structures information into discrete variables that can be aggregated, recombined, tracked, and queried (Bowker 2008). The database thus abstracts universities in a fundamentally different way from the handbook: not as unitary institutions, but as bundles of standardized attributes—enrollments, staff numbers, expenditures, publications, and beyond.

The database thus emerges as a key technology enabling what Espeland and Stevens (1998) describe as commensuration: the process of transforming different qualities into comparable quantities through a common metric. Rather than being a neutral technical operation, commensuration entails decisions about what counts, how it is

[16] The term "database" is used here as a heuristic label for a family of technologies (including, among others, flat-file, relational, and analytic databases) that share a common observational logic rather than a single technical form.

measured, and what differences are rendered equivalent or irrelevant. In this way, the database does not merely record what universities supposedly are; it imposes a grid of attributes that all universities must answer to. The absence of data is itself a data point, and the category "not applicable" is still a category. Applied to universities, commensuration therefore reorients observation away from questions of legitimacy—*Is this a recognized university?*—toward questions of type and position: *What kind of university is this, seen through standardized variables? How does it compare to other universities?* And, if data are serial, *How does it change over time?*

Compared to the handbook, the observational affordances of the database are both narrower and more powerful. Given the ontological assumptions embedded in its technical structure (Dourish 2017), what becomes visible depends not only on which categories are permitted, how variables are defined, and what data are collected, but also on which queries can be executed. Access is computer-mediated, rule-bound, and conditioned on at least some degree of specialized knowledge. But the very same constraints enable new forms of action. Once universities are rendered as commensurable data points, they can be classified into types, benchmarked against one another, and monitored longitudinally. In this sense, databases operate as boundary technologies that orient universities, government agencies, and expert communities around a shared quantitative language, stabilizing expectations about reporting and aligning institutional practices with standardized categories. Over time, universities "learn" to see themselves through the variables that render them observable and comparable, while particular forms of expertise—statistical, economic, policy-analytic—gain authority over others.

The conditions under which the commensurative regime became possible are particularly visible in settings where technical capacity, governing authority, policy rationale, and the potential to span heterogeneous user communities aligned.[17] A clear early instance of this alignment is found in the United States. The passage of the Higher Education Act in 1965 provided the legal foundation for the Higher

[17] Rourke and Brooks's (1964) diagnosis of a "managerial revolution in higher education" anticipates what would later be described as governance by numbers under New Public Management. In a way, it was the availability of standardized, comparable university data—the commensurative regime's own achievement—that made such governance by numbers viable.

Education General Information Survey (HEGIS)—a federal reporting system through which higher education institutions submitted standardized data on enrollments, staff, degrees, and finances, thereby providing policymakers with information on the condition of higher education (Miller and Shedd 2019). By then, many institutions had already begun adopting managerial modes of self-description, through institutional research offices, computerized administration, and the use of quantitative data in campus-level decision-making (Rourke and Brooks 1964). Once established, the database became more valuable as its user community extended beyond the federal government to include institutional researchers, scholars, and eventually students and the public (Miller and Shedd 2019). In the 1980s, HEGIS was succeeded by the Integrated Postsecondary Education Data System (IPEDS), still the main federal data infrastructure for U.S. higher education.

However, to argue that the commensurative regime diffused outward from the United States would be incorrect. At the time when the production of university handbooks began to strain, international governmental organizations with mandates in higher education and science had neither a policy basis nor the jurisdictional remit to intervene at the level of individual universities. Technological capacity was developing quickly, but unevenly. By one account, as late as 1985, "UNESCO had a statistics unit comprising only a handful of people equipped with a couple of outdated IBM personal computers and electrical Olivetti typewriters" (communication quoted in Elfert and Ydesen 2023, 124). By 1987, UNESCO operated a mainframe computer, which the IAU Board was planning to use to run the IAU university database.[18] This is to say that, by the end of the 1980s, technical capacity to commensurate universities at the international level was neither uniformly absent nor reliably available. Instead, it existed in a patchwork of institutional settings, even as advances in computing were rapidly transforming what was technically possible.

One of the earliest international policy rationales for building transnational infrastructures for university data took shape in the late 1980s, as cross-border

[18] "Draft Minutes of the Forty-Fifth Meeting of the Administrative Board, Harare, 7–9 April 1987," p. 8. IAU archive, Paris, folder: 1980–91 Board Minutes.

mobility and degree recognition gained importance. This rationale found institutional expression in TRACE, short for Trans-Regional Academic Mobility and Credential Evaluation, established in 1989 by national and international bodies concerned with academic mobility and credential recognition, with the IAU Secretariat as its Coordinating Agency. TRACE aimed to build a voluntary federated database of standardized, regularly updated university data by linking "existing and future educational databases" into "an international data network [...] made available worldwide" (Langlois 1988, 35). Although its founding members were concentrated in Europe and North America, TRACE expanded steadily through the early-to-mid 1990s, extending to national bodies across Latin America, Asia, and Africa. The IAU Secretariat was so committed to making it work in practice that Claudine Langlois, who coordinated TRACE throughout this period, traveled to Africa to train staff from national bodies on entering and transferring data using diskette and software built for MS-DOS, since Windows was not yet widely available there.[19] By 1996, TRACE had been merged with IAU's own institutional database into a single World Academic Database—later renamed the World Higher Education Database (WHED)—the name under which it still operates today.

The case of TRACE is particularly revealing of what the handbook could accommodate but the database could not. Where the handbook could describe various national and institutional specificities, the database required every institution to be described through the same set of variables. Letters exchanged among TRACE consortium members show how the proposed data categories—especially the ISCED classification grid,[20] which UNESCO's own statistics office promoted as an international standard—failed to accommodate the particularities of national systems. As early as 1989, NUFFIC, the Dutch organization responsible for internationalization in education, wrote to the TRACE Coordinating Agency that:

> The ISCED-classification system is definitely not suited to systems of higher education, other than the Anglo-American. To our knowledge, there exists at

[19] Interview with Claudine Langlois, TRACE Coordinating Agency, 1989–1996, 29 September 2025.

[20] International Standard Classification of Education (ISCED), a UNESCO statistical framework for organizing information on education, first developed in the 1970s.

> the moment no satisfactory system of classification of highly diverse systems of higher education.[21]

The problem remained unresolved even three years later. At the 1992 Berlin assembly, German representatives argued that the application of ISCED levels did not "give a true picture of the structure of the German system of degrees and diplomas"—a concern "echoed by a number of other Members."[22] This episode brings into view what might be called an epistemic authority problem: without a legal mandate to require reporting, no actor had the authority to impose common classifications across national systems.

At its core, TRACE was an attempt to build a commensurative infrastructure for international higher education at a moment when no international authority could mandate it. But there was one partial exception. In 1987, as the idea of TRACE was taking shape at a preparatory meeting in Bonn, the Single European Act (SEA) entered into force, committing the twelve member states of the European Community to complete the internal market by the end of 1992. The SEA had been broadly promoted with the promise that it would reverse Europe's persistently high unemployment by enabling the free movement of workers, goods, and services. However, free movement of workers presupposed reliable, comparable, and accessible information about qualifications and training opportunities across the Community, which did not yet exist. It was this gap—between the political promise of labor market integration and the informational infrastructure needed for it—that the European Commission sought to address. In a 1991 speech, the Commission's R. Charters d'Azevedo articulated this ambition by calling for a "European Nervous System" of telematic networks for education and training documentation—and identifying a database on higher education in Europe as its first priority (D'Azevedo 1991, 4, 7).

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[21] NUFFIC: "Remarks on the TRACE Questionnaire from the Dutch Viewpoint" [Kees Kouwenaar], p. 64. IAU archive, Paris, folder: TRACE profile questionnaires 1987–1988.

[22] "Minutes of the TRACE Sixth Board of Directors and Second General Assembly Meeting, Humboldt University Berlin, 9 November 1992," p. 4. IAU archive, Paris, folder: TRACE reports of meetings 1989–1996.

Over the next three decades, the European Commission funded a series of projects aiming to produce comparable data on higher education institutions across Europe. The first was Ortelius, which was launched in the mid-1990s but never moved beyond the first stage. Two more durable projects followed, each embracing a distinct approach to cross-border data infrastructuring. One of them was U-Map, followed by U-Multirank, both of which relied on direct institutional reporting, largely bypassing national statistical systems. The other, the European Tertiary Education Register (ETER), worked through national statistical agencies, which aggregated and reported institutional data at the national level. Neither approach, however, could escape a more fundamental vulnerability: unlike HEGIS/IPEDS, backed by U.S. federal law, both remained dependent on project-based EU funding and a Commission whose policy mandate over higher education was, and remains, comparatively weak. Despite a decade or more of operation, neither U-Multirank nor ETER continues as a standalone initiative, but both became foundational layers to the Commission's newest initiative, the European Higher Education Sector Observatory (EHESO). In their different configurations, each was a cross-community endeavor—typically bringing together researchers, statisticians, and policymakers—a pattern EHESO now inherits and extends.[23]

Beyond dependence on project-based funding and a limited policy mandate, these projects also had to contend with a policy rationale that kept shifting underneath them, repeatedly redefining what kinds of information were considered relevant and for what purposes. In 2000, the EU's Lisbon Agenda marked a shift in policy emphasis from internal labor mobility to global competitiveness, from qualifications to performance, and from documentation to measurement. U-Multirank was the EU's response to the emergence of global rankings. Consequently, as one of the project's founding figures put it, "the classification and mapping idea went to the background."[24] This misalignment between the long temporal horizons required for infrastructural consolidation and the short cycles of policy experimentation and

[23] European Commission. The European Higher Education Sector Observatory (EHESO). Accessed October 30, 2026. https://national-policies.eacea.ec.europa.eu/eheso.

[24] Interview with Frans van Vught, one of the leaders of the U-Multirank project, 25 April 2025.

project funding offers a further explanation for why the European database initiatives struggled to endure.

The early 2000s marked a broader reorientation in how universities were understood in policy terms, extending well beyond Europe. The emergence of global rankings in 2003 triggered a wave of policy concern across the world, as governments began to see their universities' positions in league tables as indicators of national competitiveness in science and knowledge production (Hazelkorn 2011). Within this conjuncture, the commensurative regime would enter a new stage in which universities were governed not only with a view to national system optimization, but increasingly with a view to global competition and, not least, to media attention. Where, for example, the U.S. HEGIS/IPEDS and European databases had produced annual administrative snapshots, typically of little interest to mainstream media, the releases of major rankings became highly publicized events, generating further pressure on national policies and institutional strategies—the world over (Brankovic et al. 2018).

In terms of infrastructure, however, the first global rankings required little that was new. Bibliometric databases such as the Science Citation Index had been developed decades earlier to support information retrieval within library and scientific communities, recording research activity worldwide with journals and articles, rather than organizations, as their primary unit of observation. By aggregating publication and citation records at the organizational level—a repurposing their creators had neither anticipated nor designed for (Csiszar 2020; Wouters 1999), rankings effectively drew universities into this infrastructure. More consequentially, the attention global rankings received from governments and media made bibliometric indicators a subject of interest almost overnight—transforming a library infrastructure into a tool of national science and higher education governance and strategy.

4.3 Seeing like a cloud: the extractivist regime[25]

Rather than a single technology, the cloud is more accurately described as "millions of computers and networks" turned into "a single, extremely abstract idea: 'the cloud'" (Hu 2015, xxvi). What makes the cloud analytically relevant is not its technical novelty but its ability to store, process, and integrate vast and heterogeneous data streams continuously, on a global scale and at low marginal cost, without any single organization needing to own the underlying physical infrastructure. Built upon this substrate is another technology, the platform, whose distinct infrastructural logic lies in its programmability (Helmond 2015). Unlike the handbook and the database, where the interface is either integral to the technology (the printed page) or directly attached to it (the database query interface), here they figure as distinct but connected technologies. While the cloud provides the capacity for continuous, borderless data storage and processing, the platform actively structures how externally sourced, heterogeneous data are rendered compatible with its own system—a capacity that becomes consequential at scale through its combination with the cloud.

These technological capacities, however, also create opportunities for commercial firms that own or control these infrastructures to extract value from the university data they collect, integrate, and store. By using the platform's programmability to position themselves as obligatory passage points (Callon 1986)—understood here in the sense of mandatory points of mediation through which data, interactions, and services must flow—these firms turn university data into the basis of proprietary assets, generating rent—that is, income derived from controlling access to a scarce resource (Christophers 2019). Here, the proprietary asset is less the data themselves than the infrastructure through which they are processed—the classification schemas, bibliometric databases, and analytical categories that increasingly function as obligatory passage points for the forms of visibility on which rankings,

[25] The term is adapted from political ecology, where extractivism broadly denotes a logic of resource appropriation in which control over processing and value distribution is concentrated in the hands of those who own the infrastructure rather than those who generate the raw material (Gudynas 2021). It is used here by analogy, to name a regime in which universities continuously generate data that is captured and monetized by private platform operators—a dynamic that resonates with the political economy literature on rent and value extraction (see, e.g., Christophers 2019).

benchmarking, and research evaluation depend. Van Dijck, Poell, and de Waal (2018) analyze the entanglement of public values and private platforms in sectors such as news, health, and education. Their focus, however, is on platforms mediating public goods and services, rather than on the infrastructures through which the organizations providing them become objects of observation.

The incorporation of bibliometric data into the first global rankings was perhaps the most decisive moment in the emergence of the extractivist regime, if we were to name one. This was largely because it created conditions for firms owning bibliometric infrastructures to become indispensable intermediaries in the production of rankings. This position, in turn, provided the foundation for an expanding ecosystem of cloud-based commercial products, analytics services, and platform interfaces. The emblematic cases are Elsevier's Scopus and Clarivate's Web of Science, which by the mid-2010s were increasingly repositioned from search tools for researchers and librarians into the data backbone of a suite of research management and benchmarking products (Krüger and Petersohn 2022; Lamdan 2022). These expanding product portfolios came to include competing analytics services—SciVal from Elsevier and InCites from Clarivate—both built on the same underlying bibliometric data that their respective providers supply to major university ranking producers, including Quacquarelli Symonds, ShanghaiRanking Consultancy, Times Higher Education (THE), and U.S. News & World Report (Chen and Chan 2021).

The institutional history of THE illustrates this repositioning, but from the other end of the relationship. Since its first foray into international rankings in 2004, THE has transformed from a magazine and rankings publisher into an organization whose stated mission is to "be *the definitive source* of data, insight and expertise on higher education worldwide" (emphasis added)[26] (Hansen and Van den Bossche 2022). The scale of that ambition is evident in the range of products built on its partnership with Elsevier. Beyond its flagship World University Rankings, THE's portfolio has grown to include numerous regional, subject, and thematic rankings. All rely on its

[26] Times Higher Education. About Us. Accessed October 30, 2026. https://www.timeshighereducation.com/about-us.

partnership with Elsevier, first established in 2014 and subsequently renewed, most recently through 2030, with Scopus serving as the exclusive bibliometric source across the portfolio.[27]

While the database organizes visibility around the comparability of standardized units, the platform extends and repurposes this infrastructure for the continuous capture of data from multiple sources (Dolata and Schrape 2025; Helmond 2015; Gillespie 2010). Bibliometric data are a case in point: they are generated as a byproduct of ordinary institutional activity, such as academic publishing, without requiring deliberate organizational reporting. Pure, an Elsevier platform, aggregates data on academic activities from automated Scopus feeds and manual input by researchers and administrators, encasing that earlier infrastructure within a platform (Lim 2021). Users navigating staff profiles on university websites typically encounter Pure without being aware of it: the domain, logo, and color scheme suggest a university page, while the fine print in the footer reads "Powered by Pure, Scopus & Elsevier Fingerprint Engine™."

While public databases and platforms, such as the IPEDS in the U.S. or EHESO in Europe, produce a user community as a byproduct of large-scale data infrastructure, the same technology in the extractivist regime produces a *tiered* user community as part of commercial architecture. This resembles the multisided markets described in platform economics, where a platform's value to one group of users depends on the participation of others (Rochet and Tirole 2003). Here, the expansion of the user base does not enrich a public ecosystem but deepens commercial lock-in in different ways for different users. For universities, lock-in is organizational: once staff profiles, research outputs, and self-representation online come to run on a licensed platform such as Pure, discontinuing the subscription may mean losing access to the university's own accumulated record of itself, not just to a service. For individual researchers, lock-in works through career evaluation: once citations and ranking positions become currency for hiring, promotion, and funding decisions, researchers often have little choice but to remain visible within the infrastructure (an incentive

[27] Elsevier. "Elsevier and Times Higher Education Agree New Partnership." Press release, October 3, 2024. https://www.elsevier.com/about/press-releases/elsevier-and-times-higher-education-agree-new-partnership.

the platform channels rather than creates). For governments, lock-in is bureaucratic: once products purchased from Elsevier, THE, or similar providers come to underpin national strategy and reporting routines, subsequently unwinding that dependency may prove both difficult and costly. These lock-ins do not always pull in the same direction: administrators seeking a higher ranking and staff absorbing the resulting pressure or workload have divergent stakes in the same infrastructure.

What these divergent stakes share, however, is a common structural position in the larger infrastructure, in which universities are treated as *aggregation nodes* within a proprietary ecosystem. The ecosystem itself, in turn, depends on monetizing the data that universities, their staff, and their students generate and consume simply by using it (Komljenovic et al. 2026; Szadkowski 2023). Yet this position need not be consciously assumed. Unlike the recognitive regime's formal membership or the commensurative regime's reporting arrangements, becoming an aggregation node may occur without the university's knowledge. In fact, even universities that do not engage with any of the major international rankings—quite possibly the majority of universities worldwide—may still have their publications captured by Clarivate's or Elsevier's databases. As becoming an aggregation node does not require an organizational decision, the extractivist regime operates largely without these universities' consent. The result is a markedly asymmetrical field of relations, of perception and of power.

The politics of visibility is further complicated by the layered nature of the extractivist infrastructure itself. Unlike the handbook, whose technology of observation is directly legible to any literate user, or the database, which is at least partially transparent in its variable definitions, the cloud-based platform is opaque in at least two distinct ways. The first is uniform opacity. Here, the computational parameters behind a platform's outputs remain undisclosed, even as the same rules apply to every organization subject to them. We see this when THE publishes detailed methodology documentation but does not disclose all the technical parameters used to compute its rankings, or when it introduces AI-assisted evaluation of qualitative institutional submissions without allowing universities to inspect or

contest that evaluation.[28] The second is tiered opacity in which visibility depends not on rules being universally hidden, but on the terms of one's own access, which vary by contract. In the case of SciVal, what a university can see of its own position depends on the licensing agreement it has with Elsevier, so visibility itself becomes a function of access rather than of literacy, query design, or expertise. In both cases, the opacity is a feature of the regime rather than a flaw of Elsevier, THE, or any other similarly operating company.

In this configuration, universities are valued for their connectivity, their "data exhaust," and their analytical yield, though this is rarely how platform users think about themselves. Many still approach platforms with the same questions that organized earlier regimes: *Is this a legitimate university, and how does it compare or change?* The platform answers these questions with a score, a rank, or a classification. But the platform owner is, at the same time, asking a different question, one that the platform's visible output does not show: *What yield can this university generate—as a source of data, and as a client?* The answer is not one position but two: value as a data source and value as a client, each invisible to the university being classified.

4.4 Three regimes in comparison

Table 1 brings together some of the dimensions that distinguish the recognitive, commensurative, and extractivist regimes. The dimensions listed, however, should not be treated as empirical categories into which any given case neatly falls. The features listed for each regime are emblematic rather than necessary and sufficient conditions, and elements of different regimes can be found in a single case. It is the configuration of elements, not any one of them alone, that constitutes a regime. The table itself is best read as a heuristic device rather than a blueprint. Finally, the dimensions presented are not exhaustive, and others could be added depending on the question at hand.

[28] THE data team, *Impact Rankings Methodology 2025*, Version 1.2 (Times Higher Education, 2024).

Dimension	Recognitive	Commensurative	Extractivist
Main technology	Handbook	Database	Cloud + platform
Typical infrastructure owners/operators	University representative bodies (non-governmental organizations)	Governments, intergovernmental bodies, research consortia	Commercial platform operators
Infrastructuring rationale	Coordination, mobility, credential recognition, legitimation	Governance, policy, planning, comparison, performance measurement (increasingly competition-oriented through rankings)	Commercial value extraction; monetization of data flows
Abstraction of the university	Recognized member of a community	Bundle of standardized attributes	Aggregation node in a proprietary ecosystem
Elementary classificatory question(s)	*Is this a recognized university?*	*What kind of university is this, seen through standardized variables? How does it compare to other universities? How does it change over time?*	*What yield can this university generate—as a source of data, and as a client?*
Frequency of information recording	Periodic by edition (variable: annual to quadrennial)	Periodic by reporting cycle (typically annual)	Continuous / always-on

Table 1. Regimes of observation in comparison (a selection of dimensions).

5. Regimes of observation: technology, abstraction, coordination

Drawing on the three regimes examined above, this section returns to the definition of a regime of observation proposed at the end of Section 2. It examines each of its three parts in turn—technology, abstraction, and cross-community coordination—before considering how they recombine.

We begin with technology. While it might be tempting to conclude that a particular technology drives, or even determines, the logic of its use, this is not the case. For technologies are enablers, not causes: their presence opens up a space of possibility

without necessitating any particular outcome (Abend 2022). What a technology does is make a particular use possible, but not in and of itself likely. This becomes even more obvious when we observe the more elementary technologies enabling each regime—the printing press, the computer, and high-speed internet—without which the handbook, database, and cloud platform could not have developed in the forms examined here. Yet none of these technologies contains the logic of the regime it enables. The printing press alone did not produce the handbook, nor the computer the database, nor the internet the cloud and the platform. Instead, each became constitutive of a particular regime only through historically specific forms of institutionalization, ownership, and use.

Building on this technological base, the second part of the definition—abstraction—asks not what makes observation possible, but what kind of object the university becomes once it is observed. The fundamental classificatory question associated with each regime, however, does not become obsolete when new technology, and a new regime, emerge. Instead, it becomes part of the underlying infrastructural base, with its function recast within a new infrastructural logic. The elementary recognitive question—whether a university is a recognized institution—is not ignored by the database. Instead, it either functions as a condition of inclusion, as is usually the case with official statistics, or the database determines inclusion through its own methods. For example, a university becomes visible in Scopus through a sufficient number of publications in Scopus-indexed journals bearing its institutional affiliation, from which Scopus aggregates and reconstructs the university as an organizational unit. Only then can commensurative questions be asked, university's "performance" tracked over time, or benchmarked against other universities. Finally, since Scopus is embedded in Elsevier's commercial environment, the extractivist questions about the yield of a specific university node—as a source of data, and as a client—can be asked as well, though the answers remain within Elsevier's proprietary infrastructure, invisible to universities themselves and to the wider public.

The third part of the definition, cross-community coordination, asks how the communities involved negotiate and sustain these arrangements. Boundary infrastructures, in Bowker and Star's (1999) account, are never finished but continually negotiated and reconfigured by the very communities that rely on them.

TRACE's unresolved epistemic authority problem, discussed in Section 4.2, illustrates how such negotiation may fail to produce agreement among all parties, a common feature of standardization efforts more broadly (Timmermans and Epstein 2010). This coordination is also a matter of labor: infrastructures endure only through the ongoing work of specific people and communities, much of which disappears from view as it becomes routine (Star and Strauss 1999). Miss Taylor's painstaking manual compilation of the IAU *Handbook* (Section 4.1) and Claudine Langlois's own account of training staff to enter TRACE data by hand (Section 4.2) offer rare glimpses of this otherwise invisible labor, as do the accounts of other interviewees who worked on different infrastructures.

But coordination does more than hold infrastructures together. It also establishes what Brighenti (2010) calls a field of visibility, which is not a single act of observing, but a set of institutionalized conditions determining who may observe, who is observed, according to which categories, and for what purposes. What varies across regimes is not whether coordination takes place, but how legible the terms of that coordination are to those being observed. In the recognitive and commensurative regimes, universities can at least partially inspect and contest the criteria by which they are rendered observable. In the extractivist regime, those terms become largely illegible. Universities may be continuously observed through commercial platforms whose parameters they cannot inspect, benchmarked against peers they cannot identify, and denied access to their own records without a license. To become visible in the extractivist regime, therefore, is to become the object of a gaze one cannot return.

These fields of visibility also have a temporal dimension. Much like technology and abstraction, coordination is not merely a present-tense accomplishment. It rests on multiple historical strata that coexist rather than follow one another in sequence (Koselleck 2018). As discussed in Section 4.2, the Science Citation Index was built decades before global rankings to support scientific communication and information retrieval. This original coordination logic persisted even as the infrastructure was repurposed within new relations among governments, universities, and platform operators (Section 4.3). Similarly, a university today may simultaneously be recognized as an institution in the WHED, governed through the standardized

statistics it reports to national administrative databases, and monetized as its information is continuously harvested by commercial analytics platforms—each coordinated by a different community toward different ends. These are therefore neither successive stages in the evolution of university observation nor mutually exclusive alternatives, but overlapping regimes whose logics emerged in different historical contexts and continue to operate together and shape each other in the present.

6. Conclusion

George Abbot's list of seventy-six universities offered a straightforward and in its own terms complete answer to the question of what universities existed in the world. To ask the same question today is to receive not a single answer but a myriad of them, generated by databases, registries, and digital dashboards, each operating with its own definitions and technological affordances. This evolution could be told as a story of growing complexity, from a simple past to a complex present. But telling it in this way would mean taking each answer, simple or complex, at face value, without asking what lies behind it. Abbot's list did not happen on its own. It took a particular technology, the printed book; a particular historical moment, the globalism of the early modern world; a particular genre, cosmography; and someone positioned—with the standing, the interest, and the access to resources—to produce it. It was never just a list.

Starting from the observation that organizations cannot simply be "known" in an unmediated way, the article contributes a historically grounded account of observation as an infrastructural accomplishment—technologically mediated, layered, temporally heterogeneous, constitutively political, and never settled. Taking universities as its case, the article proposes three distinct regimes of observation, each enabled by different infrastructural arrangements and emerging at different moments in history. The article argues that the regimes do not succeed one another but sediment, with earlier arrangements, or their residues, persisting as substrates that shape what newer ones can see, measure, and say. Across these regimes, universities are constituted as recognized institutions, commensurable organizations, and nodes within ecosystems of proprietary products and services. The regimes of observation

are thus not a new typology of information systems, but a way of showing how infrastructures, far from being neutral lenses, help constitute the very terms on which universities become recognizable as a distinct institution and observable as a class of organizations.

Rankings are a good illustration of why this distinction matters. They cannot be assigned neatly to any single regime. A ranking produced by a commercial company is, at one level, a commensurative device (Espeland and Sauder 2016). Yet a ranking may also perform a recognitive function, as illustrated by the role of bibliometric databases in determining which universities qualify for inclusion (Section 5). Focusing on either function alone, however, leaves aside the extractivist arrangements underlying commercial rankings, which have consequences not only for the social worlds of those being observed but also for how recognition and commensuration are performed. This entanglement is also where the concerns of organizational sociology and STS tend to meet, even if they arrive from different angles. Organizational sociology has long shown that organizations converge toward legitimated forms under conditions of external scrutiny and professionalization (DiMaggio and Powell 1983; Meyer and Bromley 2013). This article specifies observation as one sociomaterial mechanism through which such scrutiny operates. STS has shown how classification systems determine what can be counted, compared, or rendered invisible (Bowker and Star 1999), and, more recently, how platforms recombine and extract from such systems at scale (Plantin et al. 2018). These strands of scholarship illuminate different aspects of what a composite object like a ranking does. What remains less clear, however, is how these aspects come together in a single object that simultaneously performs different functions and serves different communities and actors. This requires treating the underlying infrastructure, not just its output—such as a ranking table—as the object of analysis. What this article adds, thus, is not a finer classification of specific quantification devices or platform-based interfaces, but a way of tracing how such composite objects come to be and what this means for organizations caught within them, as well as for researchers, policymakers, and publics who rely on what they show.

The analysis raises several questions that lie beyond the scope of the present article but are nonetheless worth pursuing. What kinds of knowledge become possible as

new infrastructures emerge alongside existing ones, and what forms of knowledge disappear, become inaccessible, or simply cease to count as relevant? How might this play out in science and academia, where the infrastructures that observe universities also shape what counts as research? Do these regimes operate in the same way across different parts of the world? And how does unequal access to the underlying technologies set different terms of visibility depending on where an organization is located? Which features of different regimes travel across organizational fields, and which depend on the particular histories and institutional conditions of the organizations being observed? Relatedly, since the same cloud providers, data firms, and even corporate owners often sit behind observation infrastructures across many organizational fields at once, does studying any one field in isolation understate the scale of what such firms actually control?

Whatever answers these questions receive, they share a starting point: that observing organizations is not simply a matter of gathering information. It is a matter of how particular, historically situated constructions of the social world come to *appear* as objective features of a world that simply is. Examining the infrastructures that make these appearances possible allows us to see what kinds of organizations become thinkable, comparable, and governable as a result, and what kinds, in the process, stop counting at all.

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