Governing Through Interconnections: Interoperability and Standardisation in Higher Education

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Abstract: The global higher education (HE) landscape is changing today, with HE systems facing similar dilemmas. Italian HE is characterised by a hybrid arrangement in which bureaucratic and neomanagerial features are coexisting. Recent scholarship has highlighted the role of digitalisation processes and interconnectivity across platforms in shaping educational practice and governance in HE. This research aims at investigating the unfolding of interconnectivity across digital entities in HE, and its effects. Two interconnective software used in an Italian university are examined through interviews, digital ethnography, and documentary analysis. The research highlights a close and threefold relationship between interoperability and standardisation processes in HE. In particular, interconnective textures may embed standards, exert standardising effects (on both local educational practice and the national HE governance), and become standards themselves. An alternative vision of interoperability in HE is finally articulated that focuses on collaboration and plasticity rather than control and closure.

Keywords: higher education; governance; interoperability; standardisation; infrastructure; digitalisation.

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1. Introduction

The global higher education (HE) landscape has been changing in the last decades. Longstanding academic research has highlighted the ongoing process of convergence of HE systems towards the Anglo-Saxon mode of governance and cultural frame (Neave 1998; Normand 2016).

According to this paradigm, (higher) education is expected to foster economic development and growth. The State is supposed to play as a mere evaluator of academic results and guarantor of compliance with (market) rules, whilst universities are required to compete in the provision of services so as to deliver "high-quality" – that is, efficient, flexible and cost-effective – education. Notwithstanding local re-articulations and historical legacies, national HE systems are now converging towards this mode of governance (Gornitzka and Maasen 2000).

As evidenced by scholars, digitalisation processes play a significant role in shaping HE policy and practice in HE (Selwyn 2014; Decuypere and Landri 2021; Williamson 2021). Partly as a result of the acceleration brought about by the COVID-19 pandemic (Cone et al. 2021), market actors and edtech "power networks" (Williamson 2019), as well as "fast" trans-scalar policies and discourses (Peck and Theodore 2015) on digital technologies, have a crucial impact in steering modes of governance in HE systems. These transnational standardisation actors foster the "soft" convergence of local and national HE practice and policy towards a neoliberal agenda in education that sustains the interplay between education and economy (Landri 2018). Educational quasi-markets and spaces of commensuration thus emerge in global digitalised HE (Fig. 1) that embed and perform the cultural and economic logic of the new public management model. Indeed, digital technologies are deeply entangled with sociocultural (Star 1999; Kitchin 2014; Decuypere 2019; Poell et al. 2019) and sociopolitical (Gillespie 2010; Decuypere 2016; van Dijck et al. 2018; Decuypere and Landri 2021) processes, in that they have far-reaching effects on (higher) education by exerting standardising effects on subjectivities, practices, policies, spaces, times, and cultures (Selwyn 2014; Normand 2016; Landri 2018; Brøgger 2018).

Figure 1. "2020 higher education technology landscape".
Image source: Encoura 2020

The inner workings of these complex processes are often not easy to observe as they are frequently shrouded by layers of opacity (Star 1999). Extensive research has analysed specific educational technologies (online platforms, apps, hardware, robotics, artificial intelligence, algorithms, etc.) to unravel hidden cultures and values inscribed therein and their social consequences with particular attention to design, usage, and interfaces. However, recent scholarship has highlighted the cruciality of going "beyond" the fixed boundaries of digital systems (Decuypere 2021) as "in-between" spaces provide valuable vantage points for observing the unfolding and consequences of digital practices. Far from being mere "silos", digital entities thus appear as complex and unstable assemblages that continuously interconnect thereby interweaving relational textures that link together closer and farther entities and produce multiple effects. An ever-changing and entangled space can thus be observed that is knotted together across this interconnectedness.

In the IT and engineering domains, these interconnective processes are referred to as "interoperability". While software interoperability is everywhere today (healthcare, military, home automation, Geographical Information Systems, etc.), it is now finding particular expansion in HE, where it is often framed in a neomanagerial narrative that calls for "con-

nected campuses", "smart universities", learning analytics, "AI for learning", etc. (Williamson 2018). Interoperability would thus enable to "augment" the efficacy of governance processes and learning experiences in HE institutions (HEis) by seamlessly integrating their data sources and applications. Benefits are announced for students (personalisation of the "student journey", ongoing "optimisation" of their experience, etc.), professors (360-degree view of the "student journey", reduced administrative burden), and managers (support for decision-making through visualisations, cost reduction, improved efficiency). As an example, these are some testimonies from a "success story" by Informatica, a US edtech specialising in interoperability for HEis:

> Imagine an environment where data moves seamlessly and is available to various systems at near real time speeds (…). Now imagine that data is automatically classified, cleansed, and secured while all this happens (…). (Enterprise Architect for ACC [Austin Community College]; Informatica 2020, 2).

> [interoperability] will provide us with a single source of truth for our student data – helping us ensure that (…) a student in one system is the same student in another system. (AVP Solutions Development & BI at ACC; ivi, 3).

> Data management and data integration are a "constant" in the life of any data-driven organization. ACC requires continuous evaluation for effectiveness and cost considerations. (Vice President of IT and CIO at ACC; ivi, 1).

The concept of interoperability is not new. It dates back to the late 1800s at least, with the first patents containing the term. However, its full-fledged emergence was in the military and IT literature from the 1970s onwards. In particular, in the 1990s, the vision of interoperability landed in the IT communities that were pioneering connective networks across information systems. It thus became a crucial element in imagining "worldwide digital system architecture" (Cannata 1991) such as ISDN and LAN. Interoperability then burst into everyday lives spanning e-government, healthcare, Geographical Information System, security, public safety, Internet of Things, military devices, and education software. Hence, the idea of interoperability had to be translated into policy-making at transnational, international, and local levels. The European Union launched the Interoperability Solutions for European Public Administrations programme which aimed at supporting the development of interoperable digital solutions in public services. A European Interoperability Framework was also launched aiming at promoting the development of a single digital market in Europe. With regards to education in

more recent times, the Rome Ministerial Communiqué 2020 by the European Higher Education Area has called for "new solutions to enhance the interoperability of digital systems and the exchange of student and institutional data" (2020, 6).

It thus seems fair to assert that interoperability has now become an "idea whose time has come" (Czarniawska and Joerges 1995) in many fields of social life, and on a global scale. Complex relational arrangements are now possible that unlock new challenges and opportunities in digitalised HE with the potential to reconfigure local and global educational governance. Despite the relevance of these issues, still scant research has been produced regarding the specific role of interconnectivity processes in HE governance and practice. What does interoperability do in/to HE? How can it affect the social life of HE and its practitioners?

This research aims at addressing these questions by exploring how interconnectivity across digital entities unfolds, and what effects it might produce in HE practice and processes. In particular, two interconnective software used in an Italian HEi (from now on, "Athenaeum"[1]) shall be taken into consideration.

In the first section of the paper, a brief history of HE in Italy will be drawn in order to provide a background for the empirical exploration. Thereafter, the theoretical framework of this work will be discussed. In the third section of the essay, I will present the methodological engagements of this work. In the fourth section, two interconnective software shall be unpacked in order to empirically examine the unfolding of interoperability and its effects. The empirical findings will be then discussed. Final remarks will be drawn in the last section of the paper.

2. Governing Higher Education in Italy: In-between Bureaucracy and Entrepreneurship

Continuity and change in the modes of governance in HE systems have been thoroughly studied by Higher Education Studies scholars striving to better understand the changing relationship between the State, the market, and further stakeholders in universities and society. These studies allow analysing the shifting national and global patterns in the governance of HE systems over time, as well as long-standing frictions between public and private players.

Scholarship has frequently referred to the Italian HE system as a particular case of the "continental" (Clark 1977) mode of governance of HE. Accordingly, the historical peculiarity of the Italian HE system has been found in the "bureau-professional compromise" whence it originated (Clarke and Newman 1997). On the one hand, the powerful state bureaucracy has been zealously designing procedures and *ex ante* evaluation instruments following a centralising and "control-and-command" logic

(Dobbins 2017) constraining the work of the public administration. On the other hand, actual decision-making in universities has long been happening through informal bargaining between academic interest groups (Moscati et al. 2015).

Systemic reforms developed in the 1990s aimed at limiting the power of academic oligarchies by shifting the balance of the system towards a "steering-at-a-distance" mode of governance of the State over academic activities. In particular, university autonomy was introduced with regards to governance, finance, and teaching processes, along with a Ministry for University and Scientific and Technological Research and some early quality assurance tools. However, aiming at preserving the traditional life of the system, academic guilds "outsmarted" (Dobbins and Knill 2017) the reform via local circumventions and re-articulations. The neomanagerial narrative could thus penetrate Italian universities only on a purely ideological rather than pragmatic and cultural level.

In the 2000s, Italian universities exploited the (regulated) deregulation phase in HE policy-making to multiply their activities. An anarchic situation thus emerged that the State attempted to buffer through the introduction of new regulations. This spiral of centralisation-decentralisation-recentralisation did not really bring any effective change in the governance of the system (Dobbins 2017).

Further reformist efforts were put forward in the 2010s. In particular, Decree-Law 112/2008 and Law 240/2010 introduced new grammars, repertoires, and financial levers that were more overtly inspired by the neomanagerial paradigm and the "steering-at-a-distance" model (Lumino et al. 2017). Narratives (efficiency, accountability, quality assurance) and tools (performance indicators, economic rewards and sanctions, *ex post* evaluation devices, cost-cutting) were imported from the managerial world into HE. Again, these policies did not have all the expected cultural and organisational success (Capano et al. 2016)

Contradictory patterns can thus be singled out in the governance of contemporary HE in Italy (Lumino et al. 2017) which has been aptly summarised by Giliberto Capano as "steering at a distance with strong bureaucratic oversight" (2018, 689). Across this hybrid arrangement, apparently contrasting aspects coexist which bring together legacies and new trends in Italian and global HE. On the one hand, strong bureaucratic-procedural aspects remain in the State's detailed regulation of the activities of institutions and professionals. On the other hand, instances of convergence towards the dominant Anglo-Saxon entrepreneurial model are emerging despite local resistance to change.

3. Theoretical Toolkit: Classifications, Standards, Infrastructure, and Interoperability

As discussed in the introduction, digitalisation processes in HE play a role in shaping HE practice and governance at the local and global levels. Several theoretical frameworks are available in social science literature for the analysis of the workings of digital technologies. Among these, the STS toolkit provides a valuable repertoire for exploring their relationality and performativity.

3.1 Classification Systems

The most convenient departure for this discussion might concern classification as the concept is intended within the ecological approach of STS. Classification systems are spatial, temporal, or spatio-temporal segmentations of the world. Specifically, they have been defined as "a set of boxes (metaphorical or literal) into which things can be put to then do some kind of work – bureaucratic or knowledge production" (Bowker and Star 1999, 10).

Classification systems are "complete" in principle in that their aim is to achieve thorough coverage of the world they describe – and, in fact, to overlap with it. Moral and political orders are thereby established and enforced as every object can (must) be placed in a predetermined box. When confronted with objects aberrant to the provided definitions, classification systems attempt to "make categories fit the circumstances" (ivi) according to principles of convergence. Indeed, this is about creating boundaries between what is "right" and "wrong" about the way things are organised, thereby shaping social life (Star et al. 2003). Despite their apparent stability, classification processes can always be subject to negotiation and contestation through tacit or explicit categorical work.

3.2 Standards and Standardisation

Classification systems are closely related to standards, in that standards often contribute to classifying the world (Bowker and Star 1999). Standards are often studied as agreed-upon rules to achieve "coordination and control of activities at a distance (…) by which to order and perform realities" (Landri 2018, 8). They are both inscribed in the fabric of social life, and reshape it in heterogeneous ways as they codify, incorporate and prescribe ethics and values (Bowker and Star 1999).

STS scholarship has famously described a number of dimensions characterising standards. In particular: a standard can be considered as any set of agreed rules for the production of (textual or material) objects; it spans more than one community of practice; it is used to make things work together in heterogeneous spaces, times and metrics; legal bodies

often enforce standards; the "best" standard will not necessarily prevail; standards have strong inertia and may be difficult to change (Bowker and Star 1999). Recent literature distinguishes between a realist, top-down idea in which standardisation is seen as a "complete" process that aims at constructing uniformity in space and time, and a performative, post-realist vision that focuses on how standards contribute to the creation of the world and the very alteration of what they govern (Brøgger 2018; Landri 2018; Staunæs et al. 2018).

Standardisation processes have been extensively researched in the case of education. Recent studies have explored how standards can exercise "soft" governance power in that they can establish uniformities in educational practices, processes, policies, spaces, times, and cultures (Landri 2018; Brøgger 2018). Particular – standardised – points of view on what education should be and do might be valorised and taken for granted as the legitimate and proper ones, while the others are made invisible and relegated to marginality. With differences being erased, iniquities might be reproduced in local and global educational practice and politics.

3.3 Infrastructure and Infrastructuring

As argued by Brian Larkin, infrastructure – such as databases or the internet of things – can be intended as "matter that enable the movement of other matter" (2013, 329). Infrastructures, which might become standardised (Bowker and Star 1999), can be considered as complex imbricated sociotechnical assemblages (Piattoeva and Saari 2020):

> modular, multi-layered (…) [they] consist of numerous systems, each with unique origins and goals, which are made to interoperate by means of standards, socket layers, social practices, norms, and individual behaviors that smooth out the connections among them (Edwards et al. 2013, 5).

STS scholars have identified a few distinctive dimensions of infrastructures (Star and Ruhleder 1996). They: emerge in relation to situated practices and cannot be understood "as a thing stripped of use" (ivi, 113); are embedded within other sociomaterial arrangements; are imbricated in the conventions and learning practices of communities of practitioners; are inherently invisible, except in the case of breakdowns; are interconnected. Infrastructures are also intrinsically fluid and non-linear in their spaces, timescales, and affordances. The concept of "infrastructuring" (Mongili and Pellegrino 2014) has been recently deployed to examine the constant emergence of infrastructure and its "accreting" onto installed bases (Pellegrino 2014; Karasti and Blomberg 2018; van de Oudeweetering and Decuypere 2021).

In the field of education, infrastructures are expanding on at least four fronts (Sellar 2015): the political scales in which they are becoming em-

bedded, the scope of the data that they contribute to generating, the explanatory power of the analyses that they afford, and the role of algorithms and datafication. Yet, few scholars so far have explored the processes and actors involved in the design, usage, and maintenance of educational infrastructures, as well as the relational work they afford in digital education (Sellar 2015; Williamson 2018; Aragona and Felaco 2019; Decuypere 2021; Kerssens and van Dijck 2021).

3.4 Interoperability

Being both things and the relationship between things, infrastructures are inherently relational. Whilst appearing as finite and accomplished, they continuously emerge through ubiquitous and interconnected processes (Pellegrino 2014; Sellar 2015). IT and engineering professionals often describe these processes as "interoperability", that is, "a measure of the degree to which different systems (...) are able to work together to achieve a common goal" (Ide and Pustejovsky 2010, 2) using standard technologies such as formats, procedures[2], and protocols.

STS scholars first attempted to research interoperability in the social sciences. Susan Leigh Star and Geoffrey Bowker picked up the notion of interoperability from computer science and worked it through with the concept of "convergence", that is, "the double process by which information artifacts and social worlds are fitted to each other and come together" (Star et al. 2003, 2; see also Mongili 2020). The Comparative Interoperability Project used qualitative research methods to comparatively study "interoperability strategies" in infrastructure (Baker et al. 2005, 65). David Ribes in particular has researched interoperability (2017; Ribes and Polk 2015) as "an umbrella term for the constellation of concepts, approaches, techniques and technologies that seek to make heterogeneous data work with each other" (ivi, 1515). Interoperability has also been addressed in the Computer Supported Cooperative Work literature with regard to healthcare (Ellingsen and Monteiro 2006), design (Mongili 2014), organisation (Sharma and Sawyer 2016), and welfare (Cozza 2018). It has also been discussed in data studies as a relevant episode in the journey of data that might change stories and generate social consequences (Borgman 2016; Leonelli and Tempini 2020).

With respect to education research, interoperability processes have so far received little scholarly attention. Some significant contributions have been made from STS and platform studies perspectives that emphasise the effects of interoperability processes on data production, practices, and organising activity in densely technologised educational environments (Ratner and Gad 2019; Hartong et al. 2021; van de Oudeweetering and Decuypere 2021).

4. Methodological Engagements

As mentioned, this research aims at exploring the unfolding of interoperability in an Italian HEi and its effects across such ecology. In order to explore this issue, and in the awareness that "method is not, and could never be, innocent or purely technical [...] does not 'report' on something that is already there" (Law 2004, 143), a series of necessarily categorical acts have been performed with regard to research methods.

The first choice concerned the methodological sensitivity, namely, an ecological approach. Ecological perspectives in social and human sciences are concerned with connection over separation, inclusion over difference, and continuity over isolation (Bateson 1972). Holistic alternatives are thereby envisioned that challenge boundaries and divides in social theory and everyday life. Rather than extra-social space for "long-distance" relations between actors, environment is considered as a social practice that can hold together subjectual and objectual lives and multiple realities: "there is no distinction between individual and environment. There are no natural, pre-given boundaries. Instead there is blurring. Everything is connected and contained within everything else. There are, indeed, no limits" (Law 2004, 9). In particular, an ecological perspective inspired by the STS and interactionist approach initiated by Susan Leigh Star and colleagues has been deployed in this research. Rather than on the finalistic action or primacy of individual actors, events, or inventors (Star and Griesemer 1989), relations have been understood as instances of interdependence, cooperation, and boundary work (Star 1995; Pellegrino 2014). A comprehensive and reticular examination has thus been carried out in which all entities in the ecology have been simultaneously interrogated, and any attempt to fix, stabilise or demarcate limits in platforms has been tentatively eschewed (Decuypere 2021).

A second choice concerned the empirical field for the observation, i.e., the digital ecology of a large Italian HEi ("Athenaeum"). Based on the selected methodological sensitivity and relational understanding, I proceeded by examining the connection between processes of interoperability, and educational practice and processes in Athenaeum. Specifically, I selected two case studies – i.e., two interconnective platforms at Athenaeum – for observing the entanglement between nonhuman (online platforms) and human (university governance, professors, technicians) actors in a common interconnective arena. The relational space emerging from the interconnectivity across these entities has thus been observed as a sociotechnical field of action. In particular, I looked at how the interconnective texture was designed and maintained, who and what it was holding together, how it materialised to users, who was using it and how, and what effects such interconnectivity was exerting on educational processes in the digital ecology of Athenaeum – and beyond.

A third methodological choice regarded the theoretical tools to be deployed for the investigation. As mentioned, an ecological sensitivity was mobilised to simultaneously observe multiplicity and interdependence in the empirical field. In addition, insights from STS studies were deployed to observe more closely the movement and transformations of data across infrastructure (Star 1999). These perspectives were chosen since they can provide an adequate vantage point to grasp and bring to the fore an elusive and relational object of study such as interoperability processes.

A final methodological choice concerned the research methods and techniques. Since I could not actually "see" the processes of interoperability, I have trailed and collected all the "clues" that these processes left behind as they happened: "[u]nearthing the narratives behind boring aspects of infrastructure (…) reveal (…) how knowledge is constrained, built and preserved" (Star 2002, 122). I looked for any kind of "witness" (archival documents, programming codes, governance narratives, websites and platforms, accounts from technicians and teachers, student diaries) that would hold evidence of interoperability processes. I thence conducted 32 interviews, digital ethnography, and documental analysis. In particular, the interviews allowed me to explore the design (9 IT specialists), usage (15 professors), and governance (6 members of the Athenaeum governance staff) of interconnectivity as it unfolds across and beyond the digital ecology of Athenaeum. More generally, through the interviews[3] I could investigate the construction, practice, and effects of interconnectivity at Athenaeum. A digital ethnography was also carried out in order to "watch what happens, listen to what is said, and ask questions" (Pink et al. 2016) in the digitally entangled environment of Athenaeum. Specifically, and in conjunction with the interviews, I conducted a thorough observation of Athenaeum's interconnective software interfaces and the user journeys they afford in order to inspect whether and how interconnective processes are materialised in their web pages, and to what effects. Furthermore, I analysed offline (Athenaeum's historical archive) and online sources (Athenaeum's and interconnective software producers' websites) to obtain first-hand information on the functioning of interoperability processes in the case studies and, more generally, in Athenaeum's digital ecology. Notably, I collected internal technical material on digital platforms at Athenaeum, policy briefs on digitalisation in Athenaeum, promotional handouts by platform developers communicating software features. Through the triangulative use of these techniques, I attempted to construct a richer and thicker picture of the research results. In particular, the data collected through these three techniques were analysed considering the overall objective of the research and allowing the specific perspectives opened up by the different types of data to inform each other.

5. Interoperability and the Standardisation of Higher Education: Trailing Performative Interconnections in the Digital Ecology of Athenaeum

As mentioned, two interconnective software have been observed in Athenaeum in order to explore the interweaving of interoperability and its effects. I will now describe the analysis carried out.

5.1 MOPG: the Digital Bureaucratic Governance of Academic Teaching

The HE evaluation system in Italy requires each HEi to produce extensive data on teaching activities. This information is periodically elaborated by the central HE governance (ANVUR[4] and MUR[5]) which deploys set parameters to determine whether such HEi is fit to operate, and if so, issues a formal authorisation.

MOPG is the Athenaeum platform which transmits this data from the local HEi to ANVUR and MUR via interoperability[6]. This ensures Athenaeum's compliance with a complex set of (supra)national quality assurance standards:

> Every year, the university must communicate its educational offer to MUR. The university staff must upload on MOPG some 'structural contents' that must comply with a set of constraints laid down by the MUR. (IT Specialist, G)

Accordingly, such information is requested by MOPG from professors (Fig. 2). More specifically, professors must periodically enter on MOPG data on the courses and degree courses for whose design they are in charge. If this does not happen, teaching activities cannot take place. Notably, the demand for interconnection between HEi and the systemic governance of HE establishes it as an obligatory passage point in Athenaeum's professional life and organisational practice. In other words, MOPG is becoming a standard in Athenaeum. The potency of its mediating position in this interconnective texture is very much perceived by practitioners, and it is not without consequences.

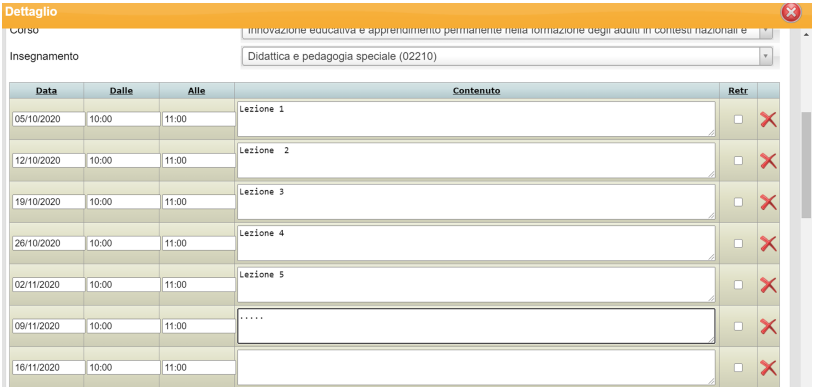

Figure 2. The frontend interface of MOPG's accountability reporting forms for professors. Image source: screenshot by the author. Last access: May 2022.

Indeed, MOPG is often portrayed by professors as a powerful actor (a "*dominus*") that can effectively dictate and constrain teaching practices and processes. Its interface seemingly exerts powerful effects on the governance of teaching at Athenaeum. According to many professors, it is only possible to do with MOPG what MOPG itself allows to do:

> When you want to experiment with innovations in the educational processes, you are forced to take into account not only the MUR frameworks, but also the actual platform, which constrains what you can and cannot do (…) MOPG is like the *dominus* that governs the architecture of the educational offer, and limits possibilities for innovation. (Professor, M)

The interface of MOPG is a rigid and fixed space that constrains the design of courses and curricula based on what categories are visible and usable. As a result, professors need to "fit circumstances to categories", as educational imaginaries rarely match with what is allowed by MOPG's interface. Users' programmes are thereby circumscribed by the platform's affordance, and the agency for educational processes is redistributed (Akrich and Latour 1992). What counts – and what does not – in academic teaching and evaluation is thus determined by the platform, while everything else is pushed into invisibility (Bowker and Star 1999):

> Since MOPG is rigid and structured in a specific way, you end up adapting procedures to the IT platform, rather than *vice versa*. Whatever it allows you to do, that will become the norm – just because it is not possible to do otherwise. (Professor, L)

> I have the feeling that in the development and customisation of digital platforms, professors are not consulted (…) Someone else makes the rules. (Governance staff, H)

Thus, MOPG-mediated interoperability seemingly constrains local educational practice through its interface, thereby potentially disciplining or hindering innovation in teaching design.

However, the effects of interconnectivity elude the local sphere of Athenaeum, as MOPG's interoperability apparently embeds and reproduces a specific cultural frame that pertains to the very governance of HE. As emphasised by professors, the information requested by MOPG often seems detached – in quality and quantity – from what is expectedly helpful for assessing professors and universities:

> They ask for an infinite amount of information. The most mysterious thing is the reason why they ask for certain absurd things. (...) I wonder what precisely they do with them. (Professor, I)

> MOPG is an administrative nightmare. (...) You have to waste a lot of time. I hate using it. I only use it because I have to. (Professor, H)

The *rationale* thus seems to be the demand for information *per se*, as if it possessed an inherent value rather than being a means to an end. Thus emerges – that is, through the impersonal and ritualistic application of procedures and norms – the bureaucratic legacy that still survives in the hybrid set-up of the Italian HE governance mode.

MOPG therefore appears as a powerful governance tool in Athenaeum that interconnects HEi with the national HE system. Positioning itself as an obligatory passage point, and affording an ineluctably rigid interface, this interconnective standard platform circumscribes the field of possibilities for local educational design in Athenaeum. Its interconnectivity also has effects on the broader governance level, in that it reproduces bureaucratic cultures in Italian HE that risk silencing the points of view of the academic actors striving to co-construct and innovate educational practice. (Bowker and Star 1999)

5.2 EYE: the Digital Entrepreneurial Governance of Academic Research

In order to participate in quantitative and evaluative title-based competitions and selections, Italian researchers are required to provide data on their scientific production to ANVUR and MUR via their HEi's platform[7]. In Athenaeum, the platform deployed for this purpose is EYE, which is an institutional repository on which researchers upload data on their scientific production.

On the local level, EYE is used by Athenaeum researchers to inform ANVUR and MUR about their scientific production. This data is transmitted via interoperability from the scale of the institution to the systemic scale for accountability and evaluation purposes. The research output uploaded by the researchers is also displayed on publicly accessible web pages that provide full-text search functions within the institution's database.

Most notably, an interconnection unfolds in this "public space" between the local scale of Athenaeum and the arena of global HE. The metadata of any research output that is uploaded by Athenaeum's staff into EYE is mechanically transmitted to bibliometric databases such as PubMed Central, Scopus, and Web of Science which return data on its performance metrics. This data is displayed as citation counts and graph-like visualisations on the EYE interface on its public web pages (Fig. 3). HEis using EYE are thus constantly interconnected with the global sphere of education and academic competition.

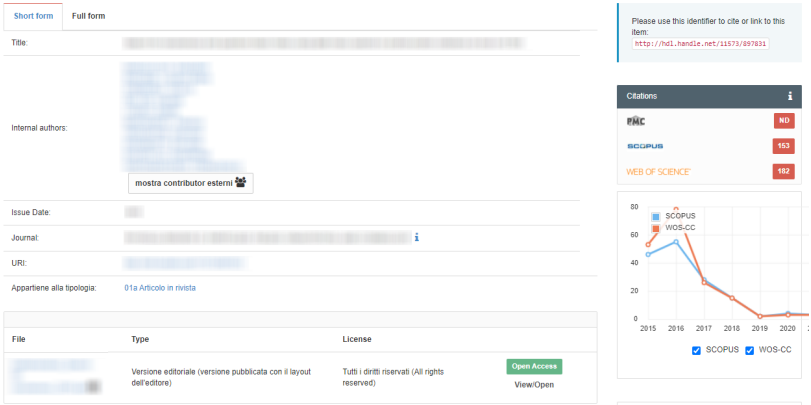

Figure 3. The frontend interface of an EYE public page: EYE and global citation databases are interconnecting. Image source: screenshot by the author. Last access: May 2022

A particular affordance is thereby suggested to Athenaeum researchers through EYE, i.e., the self-monitoring of academic performance (Burrows 2012; Lupton et al. 2017). The multi-scalar interoperability between the local institution and these powerful actors in global education constructs a visualisation device that opens a space of comparison and commensuration which might configure academic subjectivities (Espeland and Stevens 1998). Evidence-based interoperable indicators may lure Athenaeum's researchers into measuring the "quality" of their scientific publication according to quantitative standard metrics (Espeland and Stevens 2008). What "works" and what does not can thus be determined

through commensurative quantification processes (Decuypere and Landri 2021):

> This is also a "control" mechanism. Every morning I *must* check the "status" of my publications. That is, what that graph "is doing" – whether someone has cited me, or if I am visible on Scopus... (Professor, U; italics for emphasis)

Alongside its effects on the local subjectivities of Athenaeum researchers, EYE's interconnectivity encapsulates values that entail the broader field of Italian HE governance. Whilst the academic engines of anxiety are fed (Espeland and Sauder 2016), neomanagerial discourses – calculability, efficiency, excellence, etc. – are reproduced through metrics and visualisations. "Performative" scholarship and the pursuit of immediate research impact is fostered through quantitative measurement at the expense of fundamental or curiosity-driven research. New uncertainties insinuate in academic subjectivities:

> We are forced to respect what EYE wants, or else we do not exist. If we don't upload our research output to EYE, EYE does not deliver it to ANVUR, and we end up being invisible. (Professor, H)

Across this constant interconnection between local institutions and the global sphere of competition in HE, standardising processes are enacted that shape academic research and the production of knowledge. Specific and "legitimate" ways of knowing are tacitly privileged, while others are made invisible. Entrepreneurial logics are reproduced in HE as the space of quantitative research evaluation becomes a neomanagerial field for institutions and professionals that are expected to strive for excellence. The world and its constitutive relationships are constructed simultaneously with the tools for its measuring (Desrosières 1998).

6. Interoperability, Standardisation, and the Making of Higher Education through Interconnections

This paper aimed at contributing to literature by investigating the unfolding of interoperability and its effects across the digital ecology of an Italian HEi. To this end, two empirical cases of interconnective platforms have been interrogated through an ecological sensitivity and a repertoire of qualitative research techniques. After a brief overview of the empirical exploration empirical cases, I shall discuss the main points of interest that emerged in the research.

The first platform examined, called MOPG, is used in Athenaeum for the management of administrative activities related to teaching. MOPG

establishes interoperability processes in order to communicate teaching-related information from Athenaeum to ANVUR and MUR. It thus positions as an obligatory passage point for Athenaeum's professors who must however adapt their teaching design instances to the affordances of MOPG's rigid interface. Local educational practice is thus circumscribed by the constraints inscribed in the platform. However, the standardisation effects exerted by the interconnectivity processes mediated by MOPG elude the level of local practice in that they entail the governance of Italian HE as well. Indeed, MOPG seemingly embeds and performs the bureaucratic logic that constitutes one of the poles of the hybrid arrangement of the governance of Italian HE. The demand for data for its own sake is favoured over the objective of obtaining relevant information.

The second interconnective platform analysed, called EYE, is the repository into which Athenaeum researchers upload their research outputs. In this case, interoperability processes are aimed at the production of a complex interconnective texture between local actors (academic researchers) and big players in the bibliometric area of global education. EYE's multiscalar interconnectivity activates a self-monitoring comparative device for researchers' performance that draws on specific values to shape their understandings of what should be researched, and how. While interoperability processes have an effect on the local field of research in Athenaeum, they also affect the broader arena of HE governance in Italy. The engineering of a commensurable and comparable space through multiscalar interoperability reproduces the neomanagerial agenda that fosters efficiency, surveillance, and competition, that is, the pole towards which the governance of Italian HE is currently converging.

An intimate relationship between interoperability and standardisation processes in HE can thence be distinguished. In particular, the empirical research carried out allows to single out three ways in which digital interconnectivity can relate to standardisation processes in HE. First, *interconnective textures can embed standards*. They in fact encapsulate specific values and ethics that result from exogenous standardising forces. In the case of MOPG, (supra)national criteria and standards are inscribed in the design of interconnectivity which then materialise in its interface by means of spaces (filled/fixed), categories (present/absent), criteria (specified/glossed), choices (fixed/open). In the case of EYE, narratives are imported from the managerial world to the field of HE concerning visibility and comparability as basic foundations for academic life. Secondly, *interconnectivity can exert standardising effects*. The empirical cases have shown this kind of relationship on a twofold level. On the one hand, interoperability processes produce standardisation effects on the local Athenaeum practice, determining what is possible for teaching design (MOPG) or selecting what is proper for academic research (EYE). On the other hand, interconnectivity exert standardisation effects that entail the governance level of Italian HE by conveying bureaucratic (in the case

of MOPG) or neomanagerial (in the case of EYE) logics. Finally, *interconnective textures may become standards themselves.* MOPG has indeed become a stable and obligatory passage point both for compliance interconnectivity in Athenaeum, and for everyday academic professional life of professors. Likewise, EYE represents a crucial and irreplaceable tool for many academics who use it for everyday self-monitoring of their academic performance. Realities are thus uniformed through these standardised interconnective textures according to agreed-upon-rules that are supposed to articulate work across spaces, times, and metrics.

Being based on classifications and standards, this threefold relationship between interoperability and standardisation in HE is not neutral (Bowker and Star 1999). It entails the power to determine who is "in" and "out" of relational arrangements (i.e., which entities to include or exclude), and what status or knowledges are required to "stay within" relations (i.e., to negotiate the criteria for inclusion; Gorur et al. 2019). The link between interoperability and the standardisation of forms of (higher) education thus seems generative of social consequences. A transcalar, interconnected and standardised governance space emerges in HE in which research, governance, and administration, as well as (nonhuman and human) actors and discourses, are entwined and entangled. In this arena, visibility and invisibility, inclusion and exclusion, and all sorts of boundaries are continuously at stake (Star 1995). Hence, the challenge now concerns what academia, academics, and HE overall should be, do, and – most of all – become.

7. Final Remarks

A complex relationship between interoperability and standardisation processes in HE thus emerges from the empirical research carried out that may manifest as the encapsulation of standards, the enactment of standards, or the very standardisation of interconnectivity. Either way, the processes of standardisation appear inherent to interconnectivity in HE.

The texture of interoperability that ties Italian HE together ought thus not to be understood as a purely technical matter of data transmission across information systems. Beyond the imagery of digital entities chatting with each other, it might be worth considering the role of standardisation processes that exert influence on how these entities talk, what they say, and whether these conversations might risk hindering the potential for innovation and change in HE, i.e., whether dominant points of view may be advantaged to the detriment of residual and marginal forms of subjectivity and knowledge (Bowker and Star 1999).

By all means, the effects of these processes are – as always – situated and contingent. As reminded by STS scholarship, everything might have

been otherwise (Star 1990) – and might *still* be otherwise (Gorur et al., 2019). The relationship between interoperability and standardisation constructs a contested field which is the object of ongoing negotiation, local adaptation, (re)adjustment, and rejection. As shown with the empirical cases, academic actors do practice non-compliant and divergent conduct in order to express alternative visions and resist the ethics and values that are inscribed and performed throughout these processes. Indeed, all standards are bound to transform over time along with the impermanence of social life.

A space for reflection can thus be set in which to consider interoperability in HE as a tool for collaboration rather than bureaucratic or neomanagerial control. Interoperability can in fact prompt renewed engagement with connectedness as a key to understanding and cohabiting a complex, emergent, and troubled world. In this sense, it might be worthwhile to move the perspective from control to cooperation, and from closure to plasticity. That is, to focus on the power of boundary objects rather than standardisation as a means of achieving necessary alignment and articulation across the multiple worlds of technoscience (Star and Griesemer 1989). The challenge, then, is to envision practices and tools that, while maintaining their own specific identity, could be elastic enough to be engaging for diverse communities of practice, thereby becoming a means of collaboration and translation across heterogeneous social worlds in HE. This might counterbalance the controlling effects that often arise with the stabilisation of standards and the closure of their flexibility (Star and Bowker 1999).

Some practices are already underway that pursue such a vision of interconnectivity in HE. For example, open-access international Current Research Information Systems such as OpenAire and Zenodo have been launched for sharing research across disciplinary and national boundaries; alternative bibliometric forms (e.g., Snowball Metrics) are used in international universities that consider the social impact and uncited research output rather than just the citation count on peer-reviewed journals; an Higher Education Interoperable Data Initiative (HEIDI) is being developed that would interlink European HE datasets and publish them in open-access.

Other avenues to unlock the potential of interoperability processes towards participation could be explored through the analysis and constructive critique of existing processes in local and global HEIs. Ultimately, this is about practising interoperability as a medium for knowing and doing things together in organization – that is, as connectedness-in-action (Gherardi 2005) – rather than a device for distributed surveillance.

Notes

[1] Pseudonymisation has been applied on the university, software, and research partners names in order to mitigate the possibility that contextual information provided could lead to "deductive disclosure" of their identities (Kaiser 2009).

[2] In particular, APIs (Application Programming Interfaces) are used by developers as packages of procedures that software make available to outside programmes to draw on some of its functionality.

[3] The difference between the number of interviews carried out and the total number of consultants interviewed is due to the fact that two technical consultants have been interviewed for two rounds, and therefore counted as two separate interviews. As a side note, five consultants have been interviewed in a double guise, i.e., both as professors and members of the Athenaeum governance.

[4] ANVUR is the Italian national agency for university and research evaluation.

[5] MUR is the Italian Ministry of University and Research.

[6] Italian regulations stipulate that this information must be transmitted from HEIs to central infrastructure via interoperable processes and shared technical standards (Digital Administration Code, Art. 12(2)).

[7] Alternatively, it is possible for researchers to use the LoginMIUR platform by MUR. LoginMIUR is also accessible to independent researchers.

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