Digital technologies in higher education

Processes, practices, ecologies

Doctoral dissertation in Applied Social Sciences
cycle XXXIII

Sapienza University of Rome
December 2020

Candidate
Leonardo Piromalli

Advisor
Prof. Assunta Viteritti

SAPIENZA
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ABSTRACT

This research aims at empirically investigating digitalisation processes in the Italian and global higher education. Three intertwined fields are explored to this end: processes, practices, and ecologies.

First, I examine the processes of emergence and infiltration of online platforms in the global and Italian higher education. I thus attempt at identifying the origins and patterns of the main digital forms in the global scenario, as well as their promises and epistemologies. The co-shaping between technology and platformisation processes in the Italian case is also reconstructed. Furthermore, I explore the practices accomplished by some professionals (professors, governance actors, and IT specialists) dealing with digital platforms in higher education in Italy. The platforms used at the Sapienza University of Rome, the translation of the idea of information technology in such context, and online teaching during the Covid-19 emergency in Italy are inspected. The third field that I investigate concerns the wider ecologies that the interconnectedness among platforms in higher education performs, and their effects. First, the journey of the idea of interoperability is explored across time and space. In addition, efforts are made to follow interoperability as connectedness-in-action across practices, cultures and connections in the Sapienza digital ecology. In the final remarks, I argue for university teaching as a collective matter, the democratisation of university knowledge, higher education as a critical business, and the reappropriation of black boxes in policy and practice. Lastly, I attempt at envisaging ecological futures for higher education.

In order to tackle these issues, I interconnect three strands of literature. First, I adopt a Science and Technology Studies sensitivity, i.e. a processual, relational and ecological viewpoint that is receptive to the relationships among entities. Furthermore, I embrace a practice-based approach, inasmuch I consider knowledge as an emerging and situated

fact, and organisations as textures of practices in constant performance. Finally, I use aspects of critical policy sociology of education, as I am interested in unpacking how values and agendas prescribed by (assemblages of) actors become global standards.

The research is conducted through 31 interviews (with professors, IT specialists, and governance actors), digital ethnography, and the collection of subjective diaries by students and professors.

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As eloquently argued by the transdisciplinary social scientist Gregory Bateson. "[w]ithout context, words and actions have no meaning at all (…) It is the context that fixes the meaning" (Bateson, 1972, p. 14). Indeed, this research enquiry could not have existed nor it would have made sense to me without a plethora of heterogeneous actors who supported me in different ways. It is some of them that I would like to acknowledge now.

First, I thank the consultants who shared their thoughts and time with me during a challenging period in Italy and the world. Their words, ideas and affects have filled my life for several months.

Special thanks go to Prof. Assunta Viteritti. Thanks to her, I learned to think sociologically, namely, in a free and broad-minded way that welcomes complexity and tensions; thanks to her, I also learned to question that very way of thinking in order to embrace unresolvedness, suspensions, and relations. I also wish to thank Prof. Orazio Giancola. On this journey where so often I felt lonely, I was lucky enough to have his support – even in the moments of greatest discouragement – and his warmth and vast knowledge.

I also thank my beautiful friends, in all their diversity. Through red wine, guitars, laughter and intense talk, they have at once preserved me and co-created this work. Last but not least, I thank my lovely family. They discreetly and delicately stood by me, through thick and thin, and helped me in this endeavour and many others.

Rome, December 2020

CONTENTS

Part II: Processes

Part III: Practices

FIGURES

TABLES

INTRODUCTION

What is not mediated – supported, documented, managed, legitimised – by digital technologies today? Platforms, infrastructures, apps, and online artefacts of all kinds are everywhere now, and they weave the very fabric of our everyday lives. They infiltrate all spaces, times and social spheres: from health to the environment, from politics to the media, from scientific to clinics and hospitals, from finance to gender, from bank accounts to online shopping, from spiritual life to gym activities.

Nor, as a matter of fact, is the field of education exempt from this process. The policies and practices of digitalisation are indeed increasingly pervasive in such sphere. Education is now a major market in which international edtech companies compete through apps and software applications devoted to – for example – learning from home, managing students' careers, teaching online, facilitating administrative work, and much more. Education also appears as a complex social field in which multiple forms of digital governance of education intersect and enact technologies and policies on diverse scales. Furthermore, education emerges as an arena where epistemologies and visions coexist and clash.

However, digital technologies do not exist in a vacuum. On the one hand, platformisation processes are not neutral. They evoke relevant issues in policies and practices that the global emergence of the Covid-19 pandemic in 2019 has contributed to emphasise and accelerate – for instance, the relation between public institutions and platform markets, or the use of collected data. On the other hand, technologies constantly entangle and interconnect within complex ecologies mediated by standards on heterogeneous scales. Hence, online infrastructures and platforms for education interweave through ongoing processes of interconnectedness.

In this work, I empirically reflect on these tensions in order to investigate the digitalisation of higher education. In particular, this research aims at unravelling three issues: the *processes* of penetration of online platforms in the global and Italian higher education; the *practices* enacted by some professionals (professors, governance and IT specialists) engaged with online platforms in the Italian higher education; the wider *ecologies* that the interconnectedness among platforms in higher education performs, and their effects. These three topics compose as many sections of this research. How have digital platforms infiltrated the Italian and global higher education? How are they used in practice, and what effects do they perform? What happens when such artefacts connect into more complex tangles? Technology is indeed often treated as a naturalised background component in higher education institutions, yet it frequently happens as the stratified outcome of a complex organisational history. Digital artefacts are not extra-social elements, but, rather, socially and politically operational objects. I shall thus make an effort to put the invisible background to the fore and observe the intertwining of governance choices, wider sociological processes, practices enacted by heterogeneous actors, and communication within (and among) infrastructures. Through interviews, infrastructure ethnography, and the collection of subjective diaries I attempt to co-construct suitable (yet necessarily situated) knowledge to answer the abovementioned research questions. Between autumn 2019 and summer 2020 I have therefore explored the institutional case of the Sapienza University of Rome, the Italian panorama, and the global scenario of digital higher education.

In order to tackle these themes, I interconnect three strands of literature. First, I adopt a Science and Technology Studies sensitivity. It is a processual, relational and ecological viewpoint that is receptive to the relationships among entities. Furthermore, I embrace a practice-based approach, inasmuch I consider knowledge as an emerging and situated fact, and organisations as textures of practices in constant performance. Finally, I use aspects of critical

policy sociology of education, as I am interested in unpacking how values and agendas prescribed by (assemblages of) actors become global standards.

This research is composed of four parts and nine chapters through which I aim at studying processes, practices and ecologies involving digital platforms in the global and Italian higher education.

Part I of the research aims at setting the theoretical and methodological scenario. In Chapter 1 are first identified the keywords that support the enquiry. I then discuss how topics such as ecologies, knowledge/knowing, teaching/learning, digital artefacts, and the governance of higher education are dealt with in literature. I present thereafter a brief historical overview of higher education in Europe and Italy. Chapter 2 is dedicated to the methodological aspects of this work. I propose a reflexive autoethnography of the path taken towards this research and I present its objectives. Methodological engagements are then presented.

Part II of the research is devoted to identifying some wider processes that involve online platforms for higher education at the global, national and intra-institutional levels. In Chapter 3, I consider the main forms in which online platforms for higher education are currently stabilised at the global level. In particular, I discuss Current Research Information Systems, Enterprise Resource Management systems, Learning Management Systems, and Massive Online Open Courses. The contemporary landscape in higher education indeed appears as the result of a long process that started at least since the 1970s and crossed disciplinary communities, media, epistemologies, continents. These artefacts convey the behaviourist promise to break down multiplicity and extract order from chaos, transforming a disconnected mess into an integrated whole.

In Chapter 4, I observe the platformisation processes in Italy. I investigate the inter-university consortium CINECA, the expansion of the Italian virtual universities, the emergence of MOOCs,

the history of distance teaching in Italian education. I thereby identify a wide array of actors across multiple scales: policy actors, edu-businesses, standardisation agents, higher education institutions. These heterogeneous players seemingly move towards the marketisation of higher education and new public management. They embed and reproduce values and beliefs as a sociomaterial substratum which affects the everyday practices of users and institutions.

A further zooming in on the locale is operated in Chapter 5, in which I observe the composition of the Sapienza digital configuration. I disassemble its main platforms in their socioeconomic (organisation, governance, and the market) and technocultural (materialities, and their use in practice by professors) aspects. A strong stratification and fragmentation in the digital ecology of Sapienza thereby emerges. Different networks – institutional, intra-consortium, national, global – shape a constantly moving arena that reconfigures the academic mode of existence and evokes heterogeneous reactions by users.

In Part III, I move on to observe the situated practices performed by professors, governance actors and IT specialists engaged with online platforms. In particular, in Chapter 6 I observe the transformation of the idea of information technologies at Sapienza using a twofold analytical lens. On the one hand, I observe the make-or-buy decisions taken by the Sapienza governance concerning IT and the organisational arrangements they perform. On the other hand, I scrutinise the translation of such idea into practice across the actor network of Sapienza: how and when did it emerge? How did it move and transform itself over space and time, and to what effects? Thereby, I trace a 20-years-old history in which governance choices have mostly reflected the marketisation trends now prevalent in global higher education. A community of artisans met with new global managerial players to whom the supervision of IT is seemingly on the verge of being outsourced.

In Chapter 7, I examine how online teaching in higher educa-

tion has been accomplished and experienced during the Covid-19 pandemic in Italy. First, through a proximal and practice-based analysis, I describe some teaching practices deployed by professors. In particular, I focus on organisation and 'shadow' practices, teaching practices and improvisation, and informal practices and everyday life. Moreover, I consider the ways through which professors relate to the digital sociomaterial world of higher education. I articulate three engagement regimes with digital platforms: personal familiarity, in which technological environments are experienced as intimate spaces; individual plan, in which technologies are tools for a purpose; public justification for the common good, in which technologies are primarily an object for criticism.

In Part IV of this work, I reframe the previous parts of the research. Rather than observing digital actors as mutually unconnected and isolated entities, I aim at investigating the ecology within which these entities converge (i.e., the "pattern which connects" them, as Gregory Bateson so poignantly said). Therefore, I focus on the technical issue of interoperability, that is, the 'connective' capacity of heterogeneous software applications to 'speak' to each other and work in a coordinated way. In Chapter 8, in particular, I make an effort at opening the 'black box' of interoperability – where, how and when did this idea emerge? What journey in space-time has it undertaken? How is it regulated? Which disciplinary communities have practised it? It emerged through some patents since the early 1900s, but only in the 1970s (in military literature) and the 1980s (in computer science) did it began to circulate energetically; then, in the 1990s, it landed in the social sciences with the mediation of Science and Technology Studies. Today, interoperability is regulated at transnational (European) and Italian national level (AgID) and is at the centre of disputes between public values and market logic.

Finally, in Chapter 9 I carry on the ecological approach by describing some processes of translation (i.e., transfer and transformation between contexts) of interoperability in Italian higher ed-

ucation. I make an effort to move beyond a technical outlook on interoperability by observing it as connectedness-in-action, that is, an emerging process of infrastructuring in which connective textures among infrastructures and data are continuously knotted within, and across, heterogeneous ecologies; I thereby apply a Science and Technology Studies and practice-focused sensitivity. In that chapter, I empirically investigate interoperabilities in Sapienza by looking at practices, cultures, and connections. The exploration shows a link between interoperability and quality. Interoperability is indeed mostly deployed when aimed at interconnecting infrastructures that evaluate the quality of higher education systems, institutions, and professionals. Digital ecologies in higher education are thus knotted together through such ongoing interconnectedness.

In the last chapter, I draw my final remarks. I propose some reflections about university teaching, the risks and opportunities of big data, the aims of higher education, blackboxed epistemologies and the role of social theory, the relation between digital technologies and higher education, and ecological futures in higher education.

part I

the scenario

THEORETICAL ISSUES

KNOWING, TEACHING AND LEARNING IN THE EUROPEAN SPACE OF (DIGITAL) HIGHER EDUCATION

1

In this chapter, I will introduce some keywords that serve as a foundation for this enquiry (§ 1.1). Thereafter, I will briefly outline the development of higher education in Europe (§ 1.2.2) and the Italian case (§ 1.2.3).

1.1 KEYWORDS

Throughout this research I shall combine three sensitivities. First, I will draw on the processual, relational, and ecological perspective of Science and Technology Studies[1] (STS). In addition, I will rely on the practice-based approach (Gherardi, 2019), which considers knowledge as an emergent and collective doing, and organisation as a texture of practices. Finally, I will be using aspects of critical policy of education (Ozga, 2019; Regmi, 2019) that aims at observing how values, beliefs and agendas are prescribed by (assemblages of) actors and become global standards.

Interconnecting, these theoretical traditions will support me in laying down some keywords that I shall now introduce. In particular, I will review the scholarly literature around the following

1 Science and Technology Studies is an interdisciplinary research field that focuses on the mutual shaping between science, technological artefacts, and society. In contrast to the Mertonian idea of a science separate from society, the social construction of scientific knowledge is focused as an issue of sociological concern (Bloor, 1976; Latour & Woolgar, 1979). This is a microsociological and constructivist vision that aims to observe everyday practices in laboratory, sociotechnical arrangements, stabilisation of controversies, and several additional topics (Pickering, 1986; Knorr-Cetina, 1999).

subjects: ecologies, knowledge/knowing, teaching/learning; digital artefacts; quality, standards, policy, spaces, academic profession.

1.1.1 Ecologies, knowledge/knowing, teaching/learning

> *Father*: I mean, it means that knowledge is all sort of knitted together, or woven, like cloth, and each piece of knowledge is only meaningful or useful because of the other pieces—and…
> *Daughter*: Do you think we ought to measure it by the yard?
> *Father*: No. I don't.
> *Daughter*: But that's how we buy cloth.
> *Father*: Yes. But I didn't mean that it is cloth. Only it's like it—and certainly would not be flat like cloth—but in three dimensions—perhaps four dimensions.
> *Daughter*: What do you mean, Daddy?
> *Father*: I really don't know, my dear. I was just trying to think.
>
> (Bateson, 1972, p. 31)

With different nuances, *ecological approaches* focus on relations and connectedness rather than separation; they are concerned with inclusiveness over differences, and unity over distinction (Bateson, 1972; Barnett, 2017). Therefore, they propose holistic alternatives to dichotomies that are often taken for granted in social theory and everyday life (Grasseni & Ronzon, 2004). Firstly, most ecological theories highlight the deep interweaving between social actors and their environment (Bateson, 1979; Guattari, 1989; Ingold, 1999; Haraway, 2016). They refuse an understanding of the latter as a mere extra-social accessory with which actors engage in 'long-distance' relationships as implied by the dualist, idealistic and Cartesian tradition: "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, 2004b, p. 9). In addition, ecological thinking generally finds no opposition between social practices and knowledge (Schatzki, Knorr-Cetina, & Savigny, 2001; Kemmis, Edwards-Groves, Wilkinson, & Hardy,

2012) or cognitive activity (Grasseni & Ronzon, 2004). Rather, practices are regarded as complex and ever-changing nexuses of connections (Star & Ruhleder, 1996); therefore, practising equates to knowing, as the practitioner's doing is a connective, knowledgeable and sensible accomplishment (Gherardi, 2019; Strati, 2007). Moreover, the ecological idea introduces strong elements of multiplicity. No position is granted primacy in advance, and all points of view are retold synchronously, with a focus on interdependence (Star & Ruhleder, 1996; Mongili, 2007; Pellegrino, 2014a, 2014b):

> by *ecological* we mean refusing social/natural and social/technical dichotomies and inventing systematic and dialectical units of analysis (…) treating a situation (an organization or a country or interactions and actions) in its entirety looking for relationships, and eschewing either reductionist analyses that draw false boundaries between organism and environment (Star, 1995, p. 2 and 15, italics in the original text).

Ecological approaches can also be found in the vast and compelx transdisciplinary debate on *knowledge*. Philosophical and sociological sources, reflections on power structures, thinking in the field of cybernetics, and studies on 'human capital' are discussed today. According to the epistemologically prevalent position, knowledge resides in people's heads and is transmitted vertically through mentalistic processes (Gherardi, 2005). It thus corresponds to static, storable and objectively measurable 'pieces' of information which organisations can mobilise to obtain competitive advantage (Prahalad & Hamel, 1997). Hence, learning appears as a process of incremental acquisition of 'useful' or 'relevant' knowledge performed by rational individuals or organisations competing in quasi-markets (Sfard, 1998). This is the business-oriented epistemology of 'knowledge management' (Nonaka, 1994). This simplicistic, objectifying and linear vision believes in evidence-based decision-making based on the transfer and processing of stored information across automated systems (Gherardi, 2005).

This vision is opposed by a holistic one, in which knowledge is understood as 'knowing', i.e. a practical and situated enactment. As advocated by practice theorists (Lave & Wenger, 1991; Nicolini, 2017; Gherardi, 2019), knowledge is not something one possesses in her/his head, but something people do together (Geiger, 2009) "as ongoing social accomplishment" (Orlikowski, 2002, p. 249). It thereby appears as a collective, connective, aesthetic, emergent, and continuous performance – that is, a dynamic set of heterogeneous elements that come together, hold together and produce effects (Polanyi, 1958; Schatzki et al., 2001; Strati, 2007): "knowing [is] embodied, situated, and embedded in practices, and practices [are] always being done somewhere" (Law & Singleton, 2013, p. 486). Dichotomies are thereby overcome: mind/body, subject/object, tacit/explicit, formal/informal (Bateson, 1979; Polanyi, 1966; Haraway, 1985; Ingold, 1999). Such a vision makes it possible to describe the informal and unstructured learning practices that take place in the most invisible interstices of everyday life, work and training, and in leisure time (Hager & Halliday, 2006; Landri, 2012).

The archipelago of Social Studies on Science and Technology variously contributes to the debate on knowledge. STS scholars reject the Mertonian structural-functionalist perspective, which recognised to science – i.e., its institutions and actors – a 'sociological immunity' (Crabu, 2014). Rather, knowledge and disciplines are observed as constantly in-the-making processes. They are the erratic effects of the translation and inscription of practical accomplishments which are materially, discursively, aesthetically, affectively mediated (Latour, 1987; Nespor, 1994), and the result of unstable knowledge production modes in which social, cultural and technical aspects are enmeshed (Gibbons et al., 1994). Indeed, 'Mode-2 Science' (ivi) is characterised by transgressions between boundaries – between research and development, disciplines (Born & Barry, 2013), laboratory and society (Latour, 1995).

The debate on knowledge is intimately entangled with another important challenge. Higher education is currently strained between a *teacher-centred* and a *learner-centred* approach the both at global and national level (Fry, Ketteridge, & Marshall, 2008; Tucker, 2012). The teacher-centred vision of teaching is the cultural encapsulation of a social model of higher education traditionally adopted for the formation of the national élites only (Trow, 1973). Today, 'mass university' has emerged (§ 1.2.1), yet hierarchical and patriarchal habitus persist wherein teaching is regarded as a private activity of professors (Ajello, 2002; Viteritti & Pompili, 2020). Hence, lecture-style and teacher-centred instruction is still practised whereby the professor builds her/his own curriculum focusing on learning outcomes rather than the content of the course.

Participatory, inclusive and democratic forms of higher education are however emerging alongside this approach. As pointed out in literature (Viteritti & Pompili, 2020), learner-centred teaching is debated in transnational policy networks (European Commission/EACEA/Eurydice, 2017) and scholars communities (Fry et al., 2008; Hoidn, 2016; Bryson, 2016), and is actively practised in higher education. Under the aegis of constructivist and sociocultural approaches, professors experiment with innovative teaching methods and techniques, while learners participate in active and flexible spaces to the co-construction of their social learning processes (Lave & Wenger, 1991). A range of student-centred teaching practices is mobilised and tinkered with, such as flipped learning, games and simulations, peer-group learning, and research-based teaching. New dimensions for reflexivity thus find room in the academic professional practice (Schön, 1983) as professors are called to engage creatively and subjectively with their expertise. In addition, the non-formal and informal dimensions acquire new space in policy and practice, and challenge the idea of frontal and transmissive teaching. Learning, knowledge and teaching are knotted together in all disciplines and in the organisational texture of higher education institutions; they step out off the uni-

versity walls and entwine with real-world experiences.

The concept of competence also plays a part in this process. Competence is a polysemic idea (Benadusi & Molina, 2018; Gherardi & Strati, 2017) that has undergone multiple translations both at the local and global level (Giancola & Viteritti, 2019). It can be considered as a capacity of orchestrating among heterogeneous resources (Le Boterf, 2009) and a sort of mediation device which translates the tension between institutionalised knowledge and practical knowing. It therefore concerns practices of bridging boundaries – between disciplines, training and work, school and other life-worlds (Benadusi & Molina, 2018). The demand for skills from the professional field also brings forward innovative teaching experiences in which teaching is open to learning and research (learning centres, laboratories, etc.). Students and educators are therefore challenged to operate in post-disciplinary and flexible territories, through which they build bridges between education and everyday life (Barnett, 1999). In such boundary spaces, theory becomes difficult to untangle from practice, and knowledge from doing (Taylor, 2018).

1.1.2 Digital artefacts: data, standards, infrastructures, platforms

Heterogeneous digital processes form the unevenly visible fabric of social life in the West. An incessant stream of *data* and metadata is becoming the crucial token on the boundary between diverse communities of practitioners (Leonelli & Tempini, 2020). It is a key resource for e-sciences, i.e. computationally-intensive sciences that draw on big data; it is analysed and mashed-up by policy-makers for evidence-based decision and forecasting (Kitchin, 2014); it is examined for purposes of assessing and evaluating projects and for granting funds; it produces organisational rearrangements that give rise to new professional configurations (e.g., data management, data governance, data stewardship). Therefore, it is gaining increasing political and economic relevance.

Data is increasingly stored and arranged into information *infrastructures*, such as databases (Ruppert, 2012), or the internet of things (Jabbar, Ullah, Khalid, Khan, & Han, 2017). Infrastructures can be considered as complex sociotechnically imbricated assemblages (Landri, 2018; Piattoeva & Saari, 2020):

> modular, multi-layered, (…) not systems, in the sense of fully coherent, deliberately engineered, end-to-end processes. Rather, [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, p. 5).

Science and Technology Studies scholars have retraced the dimensions that characterise most infrastructures (Star & Ruhleder, 1996; Mongili & Pellegrino, 2014). They: emerge in relation to situated practices and cannot be intended "as a thing stripped of use" (Star & Ruhleder, 1996, p. 113); are embedded inside other sociomaterial arrangements; are imbricated into the conventions and learning practices of communities of practitioners; are intrinsically invisible, unless in case of breakdowns; finally, they are interconnected. Moreover, infrastructures are constantly emerging and 'accreting' on their installed bases: their stability and coherence cannot be taken for granted, nor can the linearity of their times and spaces (Pellegrino, 2014a; Karasti & Blomberg, 2018).

Generally, infrastructures embed *standards*. Standards can be considered as agreed-upon rules "to establish uniformities across time and space, achieving coordination and control of activities at a distance (…) by which to order and perform realities" (Landri, 2018, p. 8; see also Busch, 2011). Standards are immersed in and reshape social life. They are unevenly distributed across the sociocultural landscape and they codify, embody, prescribe ethics and values (Star & Lampland, 2009, p. 5). They can thereby exert a 'soft governance' and depoliticising power, as in the case of the Europeanisation of education and research (Normand, 2016). Some

standards – benchmarks, indicators, etc. – are thus made operative for 'governing at a distance' efforts as assurances of objectivity, transparency and trustworthiness (Lawn & Grek, 2012).

Digital platforms are pervasive today; they function as an opaque layer underlying our everyday digital routines. According to Jose van Dijk and colleagues, platforms can be considered as programmable digital architectures designed to order interaction among users and aimed at the systematic collection, algorithmic processing, circulation, and monetisation of user data (2018). They should not to be thought of as extra-social phenomena, but rather as "a set of relations that constantly needs to be performed" (van Dijck, 2013, p. 26). Platforms are inscribed with hidden cultures and normative values (Gillespie, Boczkowski, & Foot, 2014), are capable of constructing the social reality (Landri & Vatrella, 2019) and enacting visions and subjectivities (Decuypere, 2018; Decuypere & Landri, 2020).

Hence, if considered with an STS sensitivity, digital objects cannot be regarded as static and technical entities. Rather, they are complex artefacts entangled in continuous *agencements* (Gherardi, 2016), i.e. heterogeneous sociotechnical processes of 'connecting with', wherein connectings and becomings enact agency. Algorithms, standards, discourse, knowledge, institutions, practitioners, markets, governance, business models, stocks, assets thereby come together and hang together. Nor, for that matter, are digital artefacts closed and fixed. Instead, they appear like threads in complex textures that hold themselves together through joints and seams; they are never permanent, as they are constantly changing and drifting (Ciborra, 2004). Moreover, digital entities are not neutral. They can be analysed as sociotechnical devices that are inseparable from their production processes and productive effects (Williamson, 2017). They inscribe and perform epistemologies, values, beliefs and desires of their creators (Selwyn, 2016), possess agency and shape the everyday life of their users (Kitchin, 2014; Williamson & Piattoeva, 2019) thus keeping the *status quo* or bringing

about change in all aspects of work and everyday life (Lupton, 2018).

Digitalisation is making its way at all levels of education. Schools are becoming increasingly digital (Selwyn, Nemorin, Bulfin, & Johnson, 2016), as well as lifelong learning (Romito, Gonçalves, & De Feo, 2020), higher education (Williamson, 2018) and every aspect of the academic mode of existence (Selwyn, 2014; Decuypere & Simons, 2016; Lupton, Mewburn, & Thomson, 2017). Heterogeneous forms of digital governance of education (Landri, 2018) are being fabricated and enacted throughout Europe and beyond.

1.1.3 Governing higher education: quality, standards, policy, spaces, technologies and the academic profession

An issue of great importance for higher education at the global level concerns its marketisation. Today, higher education is becoming a socio-economic space in which heterogeneous players – in terms of composition, logics of action, and scales – compete for economic primacy (Thompson, Savage, & Lingard, 2016; Williamson, 2020b; Fig. 1). These tensions are interpreted in various ways in literature. For example, some authors observe the social construction of this field and the emergence of actors in a platform society (Van Dijck et al., 2018). Other scholars criticise the neoliberal matrix of these processes that re-articulate the relations between the State and the market (Grimaldi & Ball, 2019).

These broad processes concern all aspects of higher education. A vision of higher education as a common good persists wherein it is regarded as a pivot for civicness and democratic participation (Marginson, 2016). However, the privation of educational systems is increasingly significant, in a double form: exogenous, as the direct expansion of the private sector; and endogenous, as the progressive importation into the public sector of the logic, values, techniques and idions of business management (Ball & Youdell, 2007) – that is, as new public management (Gunter, Grimaldi,

Hall, & Serpieri, 2016). With respects to higher education, this process dates back at least to the 1990s.

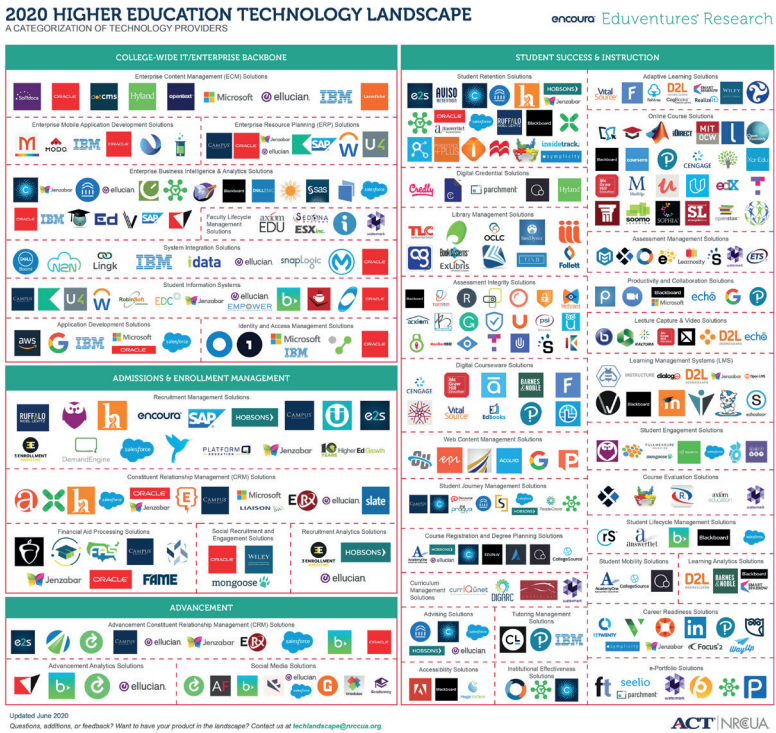

Figure 1. "2020 higher education technology landscape" as constructed by Encoura (source. Wiley & NRCCUA, 2020)

Driven by the vision of knowledge management and its stabilisation in the new public management paradigm (§ 1.1.1), '*quality*' emerged as a central element in higher education governance – from the transnational level up to intra-institutional micro-policies (Machado-Taylor, Soares, & Teichler, 2017). Hence as maintained by critical policy sociology of education (Ozga, 2019; Regmi, 2019), the only knowledge valid for the work of governing within the increasingly networked European policy space (Ozga, 2014) is the evidence-based, generic and decontextualised knowledge

that prescribes what needs to be done – 'what(ever) works' in education (Ozga, 2020). Therefore, quality assurance technologies assembled by transnational networks and national governments (Gorur, 2011a) are made operative to perform evidence-based and comparative evaluations, rankings and quantifications (Mennicken & Espeland, 2019) among diverse entities (Novoa & Yariv-Masha, 2003) such as education systems, processes, institutions, subjects (Espeland & Sauder, 2016; Brankovic, Ringel, & Werron, 2018; Decuypere & Landri, 2020).

Global standardisation processes in education are indeed becoming ever more pervasive as transnational soft governance agencies (Normand, 2016) prescribe to national governments standards, indicators, benchmarks and best practices for the governance of education (Brøgger, 2019). The journey of these artefacts in global arenas produces the transnationalisation and Europeanisation of educational processes (Lawn & Grek, 2012) as well as the imposition of normative visions of education (Landri, 2018) that are often based on new public management discourses of performance, quality, effectiveness. Both human actors – experts, policy-makers, policy networks, etc. (Normand, 2016) – and non-human actors – such as policies (e.g., the Bologna Declaration), standards (e.g., the Dublin Descriptors), policy tools (e.g., LSA datasets), discourses (e.g., the 'key competencies' for the 21st century) – play a role in mediating these isomorphic processes. The field of education in Europe thereby becomes a global policy field (Lawn & Grek, 2012). At the same time, universities are growingly engaged with third mission efforts as more and more connections are established among research, design, production, development of new products, processes, and projects.

Amidst compliance and micro-resistances to these processes, a significant restructuring happens in the academic profession and careers. The academic professor is regarded as a key resource for achieving the institutional goals – as the 'sculptor' of quality in higher education (Machado-Taylor et al., 2017)2017. The meas-

urement of teaching and research quality – and the ability to build relationships with the market and the stakeholders – thus puts academic performance under constant monitoring through devices and platforms which allow its visualisation and make it evaluable (Kogan & Hanney, 2000). Evaluation is indeed brought forth as a multifarious political project within and across the European epistemic governance to regulate higher education systems and actors (Grimaldi, 2020). The autonomy and self-determination of the work of academics is thereby reconfigured (Espeland & Sauder, 2016; Barbato, Moscati, & Turri, 2019). On the one hand, academics are required to develop new expertise (administration, fund finding, coaching, etc.). On the other hand, the academic profession is increasingly fragmented as diverse logics and professional identities are supposed to coexist in academic subjectivities (Normand, 2016) – managers, entrepreneurs, employees, etc. – and new forms of measurability and anxiety (Espeland & Sauder, 2016) are introduced.

1.2 HIGHER EDUCATION IN EUROPE AND ITALY

The issues, tensions and challenges observed so far do not arise in a vacuum. Rather, they are historical facts that have emerged in and shaped European and national higher education systems. A brief overview of higher education in Europe shall now be provided (§ 1.2.1). Afterwards, I will analyse the case of higher education in Italy (§ 1.2.2).

1.2.1 Higher education in Europe: A brief overview

The forms and sociocultural functions of higher education have transformed over time, both reproducing and enacting social change. Founded in the Middle Ages as an institution devoted to the preservation and reproduction of knowledge, in the early 19th century it became a 'Humboldtian' centre of scientific elaboration for researchers (Moscati, 2012). Only with the changes in

the 1960s and 1970s higher education lost its elitist orientation and developed as 'mass university' (Trow, 1973; Capano, Regini, & Turri, 2016). Not least through the struggles of its practitioners, it became a right for all students rather than the prerogative of a chosen few.

During the 1980s and 1990s, a wide and complex process of policy change accelerated and expanded in European higher education. A European Education Policy Space was assembled across a broad process of Europeanisation of educational policy (Lawn & Grek, 2012). A strong policy agenda was proposed at the European level that was based on the logic of new public management and the idea of a 'knowledge triangle', i.e. the 'virtuous' interweaving of higher education, research and business (Normand, 2016; Stensaker et al., 2019). A set of policies was therefore enacted at the European level that constructed quality assurance bodies, established transnational standards and assessment methods, proposed third mission projects, and called in the keywords of efficiency, effectiveness, and accountability. At the European level, Delors' White Paper (1993) and the Lisbon Strategy in particular contributed to the articulation of a European agenda of 'knowledge economy' which fabricated a deep nexus between the issue of the 'quality' of education and its capacity of fostering economic development (Normand, 2016). The Bologna Process reforms emerged within this frame to improve the recognisability and comparability of degree certificates, so as to encourage the mobility of students in the European higher education space and increase its competitiveness.

At the level of individual countries, the neoliberal push has sometimes been very powerful (Capano et al., 2016), as well as the gradual establishment of a 'corporate model' of university governance (Stensaker & Vabø, 2013). In this context, the Anglo-Saxon higher education model – which attributes importance to external stakeholders to the detriment of the State – is becoming increasingly central in continental European countries as well. Indeed, higher education is no longer regarded neither as an instru-

ment for the construction of the State, nor as a guarantee of social order (Moscati, 2012).

1.2.2 Higher education in Italy: Historical processes and the 'evaluation turn'

Higher education in Italy emerged around the bureau-professional compromise (Clarke & Newman, 1997), i.e. "through the combination of a centralised Napoleonic structure with the Humboldtian model based on the chair structure, the autonomy of the teacher and the unity of research and teaching" (Lumino et al., 2017, p. 4; see also Moscati, 2009). Such features were also present in the university of the Fascist regime, that was later inherited by the Italian Republic. This was an elitist and centralised system composed of 25 public and 3 private universities, attended by 250.000 students, in which universities and vocational higher education were separated (Capano et al., 2016).

The first signs of change occurred from 1963 onwards, with several failed attempts to liberalise access to university and transform the Fascist laws. The Malfatti Decree of 1973 – the first policy on higher education after the Fascist period – dealt with staff issues only, rather than attempting a structural reform plan. The first proper reform act (ivi) was the Presidential Decree 382/80, which focused on the academics' careers and introduced organisational and cultural innovations as well, e.g. the creation of departments, the establishment of three academic categories, and the institution of doctorates. Law 168/1989 led to the creation of a Ministry for University and Scientific Research (MURST[2]) and

2 The Italian Ministry in charge of the University has gone through several changes in its organisation and name. During the history of the Italian Republic, it has been merged with the Ministry of Education many times, taking as its name Ministry of Instruction, University and Research (MIUR). At the time of writing (November 2020; Government Conte II), it is autonomous with respects to the Ministry of Education (whose Minister in charge is Lucia Azzolina). Its current name is Ministry of University and Research (MUR). Its

greater autonomy for universities. In the following years, the system governance was reformed with a law on new academic programmes (341/90) which also established the National University Council[3] (CUN) and introduced short academic degrees (three years), a law on financial support to students (390/1991), a review of higher education development plan (245/1990) and a law on university autonomy (which did not pass).

The 1990s saw the beginning of a process of modernisation of public services that also influenced the university system (Capano et al., 2016). During those years, the translation into the Italian higher education of the European agenda – that was based on new public management and quality in education – was accomplished as part of the Bologna Process. As remarked by Vaira (2011), this 'evaluation turn' (Lumino et al., 2017) happened in Italy with local specificities based on the strength and pervasiveness of the State (Moscati, 2009), the chronic political weakness of the intermediate structures between academics and ministerial regulatory centres, and the corporate tradition in the academic community (Clarke & Newman, 1997). The Gelmini Law (Law 240/2010) was also in line with these European trends (Gambardella, Grimaldi, & Lumino, 2020) since it introduced the ANVUR[4] quality

Minister in charge is Gaetano Manfredi.

3 The National University Council (CUN – Consiglio Universitario Nazionale) is the advisory and proposing body of the Minister of Education, University and Research. As the elective body representing the university system, it expresses opinions, makes proposals, adopts motions and recommendations, and carries out activities of study and analysis on any subject of interest to the university system.

4 ANVUR (Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca - National Agency for the Evaluation of the University and Research System) evaluates the quality of the research outcomes of Italian universities and research bodies as well as their internal articulations (Departments and similar structures), mainly through peer evaluation. As a case of national agency for evaluation, ANVUR presents anomalies with respect to European patterns. An evaluation agency should be characterised by inde-

control body and the AVA[5] system in the Italian higher education system.

Today, the evaluation issue is at the core of debate and academic everyday practice in Italy. On the one hand, it is argued that a pluralist and democratic evaluation (Stame, 2016) can benefit the university system. On the other hand, some authors believe that inquisitorial or 'punitive' evaluative cultures (Pinto, 2012) and technologies are prevalent in Italian higher education.

The issue of digitalisation policies, which will be dealt with later in this work (§ 4.4), also involves the Italian arena today. This is a matter of relevance for global higher education that reaches the local context prevalently through the mediation of the European polity.

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pendence; in contrast, ANVUR's members are appointed at ministerial level. Moreover, ANVUR performs evaluation activities that relate to several objects of analysis (universities, departments, institutional activities and outputs, professors and their work). For these reasons, ANVUR does not comply with the European Standards and Guidelines and is therefore not present as a member of the European Association for Quality Assurance in Higher Education (Decataldo & Fiore, 2018).

5 The AVA system (Autovalutazione – Valutazione periodica – Accreditamento - Self-evaluation, Periodic Evaluation, Accreditation) constitutes the whole of ANVUR's activities. These concern the initial and periodic accreditation system for degree courses and universities; the periodic evaluation of quality, efficiency and results achieved by universities; and the enhancement of the self-evaluation system for quality and effectiveness of the universities' teaching and research activities.

THE ENQUIRY
CHALLENGES, QUESTIONS AND METHODOLOGICAL ISSUES

2

In this chapter, I shall first describe how this enquiry has emerged, how it was practised, and how its aims have come to the fore over time (§ 2.1). Some methodological engagements will be discussed thereafter (§ 2.2). Lastly, I shall move on to the methods and techniques I used and to a brief description of the field site (§ 2.3).

2.1 A REFLEXIVE JOURNEY: Challenges and aims

This work has never been oriented, guided or limited by any kind of 'research aims', in the conventional sense of the term; rather, its purposes have been constantly fluctuating according to the changeable paths that the research itself was taking. On the one hand, this has been a constant source of disorientation, anguish, and, occasionally, of embarrassment. On the other hand, it has also been a great exercise of freedom, as it allowed me to keep all options open, and challenge many of them. As a matter of fact, I have dealt with several themes during my PhD (sociology of politics, epistemologies, learning practices, educational standards and policies, digital technologies in higher education) and never kept myself anchored to one research issue in particular.

2.1.1 From the visible to the invisible: The digital as a matter of concern

This research work, as it slowly accreted, is the emerging effect of the tension between two tensions that I can now distinguish. Together, they outline a path during which my research interests,

theoretical background, approach to the field, resources and mistakes have changed.

Since the last year of my master's degree in Sociology, I have been interested in the topic of digital technologies in education. Initially, I focused mainly on the processes of dematerialisation of educational practices through digital technologies. I analysed the most visible effects of digitalisation: standards, infrastructures, platforms, practices. What happens in/to governance, teaching and learning when they are mediated by technology? In the first period of my PhD, I investigated these themes. I empirically researched virtual universities in Italy, and Italian MOOCs.

During the summer of 2018, while I still could not find a topic for my dissertation, I came across the European standard CERIF. Even though it was August, I contacted the protagonists of this 40-year-old story. I was lucky. They immediately replied and sent me material both by e-mail and paper mail (Fig. 2). That was my first encounter with the empirical field.

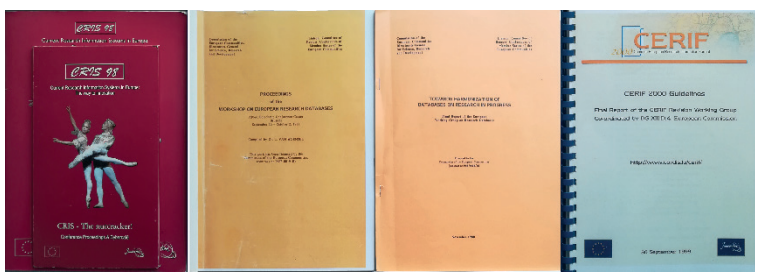

Figure 2. The CERIF documentation I received by paper mail (source: photograph by the author)

At first, I explored CERIF as a policy tool (Lascoumes & Le Gales, 2007) for the enactment of Europeanisation processes. Analysing the documentation of this object, however, I realised that the main peculiarity of CERIF laid in the interoperability capability it provides: CERIF allows information infrastructures to 'talk' to each other (§ 8; § 9). From there, I moved on to investigate the very concept of interoperability.

This was the beginning of a new phase for my research. I was no longer particularly interested in the analysis of what the digital does visibly. Rather, I focused on the observation of the digital as a process in itself – as a matter of concern (Latour, 2004). The innermost qualities of the digital became an object of interest for my enquiry: how do infrastructures emerge? And how do they interconnect? While moving from visible effects to invisible processes, I integrated consolidated sociological literature with STS theory. My purpose then became to talk about ecologies in higher education.

2.1.2 "I can understand nothing!"

In February 2020, I began to negotiate my access to the empirical field. My research interests were converging in the story that was slowly emerging. However, a challenge arose: how can technology be investigated from a sociological – i.e., non-expert – point of view? I realised that I would have had to study both non-humans (the technical artefacts) and humans (the computer scientists who co-constructed them). I managed to gain access to the field through a number of emails. However, I could understand nothing of what the technical experts I consulted were telling me. They spoke in their professional and idiomatic language:

> *Leonardo*: Practically speaking, how does this shift from the non-CERIF descriptive model to the CERIF descriptive model take place? Is it a sort of mapping? And where does it happen?
>
> *CINECA IT specialist*: Yes, of course. Of course. That's exactly the problem – that you need equivalence at a certain moment. This is also because physically – trivially – our tables in the old management system, which is now disused, were materially named with the names of the entities; so, in that management system you would even have had a '1:1 mapping' – if you like – between the two models. In this other version of the management system, being the repository unstructured, it [the mapping] is reconstructed both on a relational layer and

> on a layer of services (i.e., of interoperability) which at that point can 'speak' various dialects. We do not have an export in XML-compliant CERIF, but we typically produce the CERIF model in direct interoperability formats. Let me give you an example: for the bibliography, [we use] the MODS, or the OAI-DC, or various citation formats. So, when it comes to the integration of different systems – think of the ministerial system, you know, LoginMIUR – interoperability is all based on MODS-based interchange. (CINECA IT specialist)

As an anthropologist in an unfamiliar territory, I found myself immersed "in a world beyond my competence" (Hastrup, 1995, p. 17). The IT specialists' idiom was too far away from my experience, and I could not find a 'bridge' language to achieve understanding. I did not want to make that a shared problem that would cause a loss of confidence and time; therefore, I did not reveal my ineptitude to the consultants, and grasped what I could.

After some interviews, I realised that without a proper competence in the technicians' language I could not accomplish my ethnographic work (Atkinson & Morriss, 2016). I therefore started acquiring deeper expertise of the practice and learning the developers' tongue. Since no single body of competence was sufficient for my purposes (Atkinson, 2006), I had to study books and paper authored by practitioners of diverse disciplines: computer scientists, computer engineers, and systems engineers. Through such a (non-formal) apprenticeship, I was then able to gain expertise in the practice (Coy, 1989; Downey, Dalidowicz, & Mason, 2014), and equip myself to learn further. I could eventually knowledgeably discuss with experts as a novice in their community of practitioners (Lave & Wenger, 1991).

However, after a while I realised that I had gone too close to the technicians' *episteme*. When I talked with them, I was unable to retain my sociological knowledge (Hastrup, 1995); I could only think and act as a novice in their community. I had assumed non-reflexively the point of view of the native. In order to 'make the familiar strange', I had 'made the strange familiar' (Geertz,

1977) – but, at that point, I could not go back.

However, as time went by I could increasingly 'see' (Goodwin, 1997) their professional language. I was acquiring a greater expertise on the practice: "the ability to see is something that one has to learn" (Knorr-Cetina, 1999, p. 22). I could thereby de-blackbox the empirical field and position myself in the middle between the technical and the sociological knowledge. The transcriptions that I thought as arid and silent became full of meaning. From then on, I began to relate, ask questions, create chronologies, and envision relationships.

2.1.3 Fieldworking during the pandemic: Imagining infrastructures

In the meanwhile, the Covid-19 emergency had exploded in Italy, and it led to new complexities for this research. Originally, I expected I could observe design meetings, inspect servers, record the interaction between designers, and attend classroom lectures. Instead, (apparently) external phenomena occurred that I had to take into account on different levels.

On the one hand, research became increasingly heavy during the (variably 'hard') lockdowns in spring and autumn 2020. Physical loneliness and the relentless non-human companionship of my computer did not help my creative effort. On the other hand, the pandemic meant a further scientific endeavour, as I had to reconfigure the methodological plan to carry out the research online.

Above all, I have only been able to imagine the infrastructure I intended to physically observe (which I expected as the most entertaining part of my work). Forced at my desk, I examined things that could not be seen, with a language that only from a certain moment I could (a little) master.

Finally, in November 2020, while the Covid-19 pandemic is going through a new upsurge in Italy, I finish writing this work and leave this chapter for last. Only now can I properly frame its

objectives and give them a purified expression in a technical sociological language:

> This research aims at empirically investigating digitalisation processes in higher education. To observe such field, a proximal vision (Cooper, 1992; Giancola & Viteritti, 2014) has been privileged, that is, an approach that sensitizes to the qualitative and thick (Geertz, 1977) aspects of social life. Moreover, a practice-based outlook (Gherardi, 2019; Landri, 2012) has been adopted in order to observe the micro-episodes of everyday life focusing on relationality and processuality.
>
> The overall objective of the research has been operationalised in three research questions to which correspond as many sections. The first research question is dedicated to the exploration of some processes at work in digital higher education:
> RQ1: *How did online platforms emerge and how did they infiltrate the global and Italian higher education?*
>
> An attempt has therefore been made to identify the origins and patterns of the main digital forms in the global scenario, as well as their promises and epistemologies. Furthermore, the co-shaping between technology and platformisation processes in the Italian case has been reconstructed.
>
> The second research question is related to the situated practices of professors, governance and IT specialists dealing with digital platforms in higher education in Italy:
> RQ2: *How are higher education platforms used in practice, and what effects do they perform?*
>
> The platforms used at the Sapienza university of Rome, the transformation of the idea of IT in such context, and online teaching during Covid-19 emergency in Italy have been studied to respond to this question. Reflections have been set on the visible and invisible work enacted by platforms in Italian higher education, the connections they establish with other practices and artefacts, the engagement they stimulate in professors, and the sense they contribute to giving to practices.
>
> The third research question concerns the ecologies among online artefacts, and interoperability processes:
> RQ3: *How do digital entities interconnect, and what happens when they do?*
>
> First, the journey of the idea of interoperability has been

explored in space and time. In addition, efforts have been made to reassemble digital ecologies in order to follow standards, practices and cultures as continuous connectedness within Sapienza university.

In the last chapter, final remarks have been drawn. In particular, conclusive reflections have been proposed about university teaching, the risks and opportunities of big data, the aims of higher education, blackboxed epistemologies and the role of social theory, the relation between digital technologies and higher education, and ecological futures in higher education.

2.2 METHODOLOGICAL ENGAGEMENTS

As described, this research has been conducted in an open and scarcely structured manner. I can now recognise some methodological engagements to which I believe I have committed – more or less consciously – for the entire duration of this work.

First, I have embraced an Actor-Network Theory sensitivity, inasmuch I researched social life as the ongoing performance of the ever-changing assemblages within which it is embedded (Latour, 1984; Law, 2004a). Hence, non-humans – things (Suchman, 1987), policies (Peck & Theodore, 2015), affects (Gherardi, 2017), etc. – belong to and perform the social, just like humans. This sensitivity permeates this work and the access to the empirical field. In order to gain an access to the fields of interoperability, I followed Bruno Latour's methodological suggestion "to follow the actors themselves" (Latour, 2005, p. 15). I strategically aligned with the technical vision of infrastructural actors and followed (Czarniawska, 2014) interoperability in its materialisations (technologies, documents, discourses, etc.) on different scales (national, transnational, institutional). I was thereby able to reconstruct the relationships between the actors and trace networks.

While fieldworking, I have adopted a 'humorous' approach with an active-listening orientation (Sclavi, 2003, 2005). This methodology was developed by anthropologist Marianella Sclavi for car-

rying out social research and creative conflict management. It is based on the thought of Gregory Bateson's[1], who identified two types of 'change': $change_1$, which happens within an unchanged frame of action and meanings; and $change_2$, in which the frame itself shifts (Bateson, 1972). Active listening, which Sclavi relates to Michail Bachtin's exotopia (1975), consists of the ability to operate bisociations. Bisociations happen when someone recognises and welcomes with humour – and via emotional signals – the heterogeneity of meanings that can be attributed to the same concept and, at the same time, the equal meaningfulness of such meanings (Koestler, 1964). I applied this approach in eleven semi-structured interviews with technical actors engaged at Sapienza. After a few sentences of the first interview, I already felt uneasiness and annoyance for the answers I was receiving to my questions about interoperability. Interoperability revealed as an epistemologically bisociated concept: to my consultants, it was a technical, static and linear property; conversely, I considered it as a sociotechnical, mobile and complex process. Exotopically, I chose to "assume that [the other] is right and ask him to help you see things and events from his perspective" (Sclavi, 2003, p. 63) recognising the dissonance between frames in a non-judgmental but rather humorous way (Sclavi, 2005).

Lastly, I have been reflecting, since the beginning of this research, about the performativity of research methods. As eloquently put by Donna Haraway: "it matters what we use to think other matters with; it matters what stories we tell to tell other stories with; it matters what knots knot knots, what thoughts

1 Starting from Bateson's seminal contribution, a growing body of literature has been developed on the theme of learning levels in which several keywords can be identified, such as $change_1$/$change_2$, transformative learning, double/triple loop learning, meta-learning, etc. For instance, interesting research has been produced in systemic psychology (Watzlawick, Weakland, & Fisch, 1974), organisation studies (Argyris, 1976), Science and Technology Studies (Star & Ruhleder, 1996).

think thoughts, what descriptions describe descriptions, what ties tie ties. It matters what stories make worlds, what worlds make stories" (2016, p. 12). On the one hand, this means that the choice of methods for scientific research is never neutral[2] (Desrosiéres, 1993; Law, 2004a), and that spaces are open for criticism: "working in the world to create analytical contexts; but also on the world, to articulate and press particular contexts and their politics" (Law & Singleton, 2013, p. 499).

2.3 METHODS AND TECHNIQUES: A proximal bricolage

At some point in this journey, I decided to bring the research into the empirical field of a higher education institution. I choose the 'Sapienza' University of Rome for a twofold reason. First, its representativeness on a European level, as it is the largest public university in Europe (§ 2.3.1); second, my previous familiarity with its IT tools.

For the empirical exploration of the field site, I opted for a proximal (Cooper, 1992) bricolage among various qualitative techniques (Denzin, 2015): interviews, subjective diaries, digital ethnography.

First, I conducted 32[3] semi-structured interviews[4] with consultants[5] from Sapienza and other Italian universities. They were

2 "[M]ethod is not, and could never be, innocent or purely technical. If it is a set of moralisms, then these are not warranted by a reality that is fixed and given, for method does not 'report' on something that is already there" (Law, 2004a, p. 143).

3 The discrepancy between the number of interviews and the total number of consultants is due to a double factor. First, two technical witnesses have been interviewed for two rounds. Secondly, five consultants have been interviewed within the same sessions, both as professors and governance actors.

4 The average duration of the interviews was 56 minutes.

5 I have chosen to reject the terms 'interviewees' or 'informants' in this work, as they carry an essentialist vision of knowledge and social representations. These terms also perform a passive and ancillary vision of the research

distributed[6] as follows: 6 governance actors, 15 professors[7], 9 IT specialists[8]. These interviews served as the empirical basis to obtain insight on Sapienza's IT infrastructure at a technocultural and socioeeconomic level, the translation of informatisation in Sapienza, the practical uses of its platforms, and interoperability in practice among its platforms (Part III and Part IV of this research).

In addition, I asked 9 volunteers (4 undergraduate students, 2 PhD students, 2 professors, 1 postdoc researcher) to send me for one month a weekly diary[9] of their distance learning/distance

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co-protagonists, whose function would be to merely inform the researcher (Lassiter, 2005). Still, it would not have been correct to refer to them as 'collaborators' or 'epistemic partners' (Holmes & Marcus, 2012) as this research has not been conceived with a collaborative design wherein witnesses are allied in the design, research, or writing phase. Therefore, I have opted for the term 'consultants' – as suggested by Luke Eric Lassiter (2005) – to reposition the classic 'informants' as "co-intellectual[s]" equipped with agency, co-interpreters and co-producers of the knowledge constructed during the investigation.

6 Unfortunately, I could not access to the administrative staff's professional community and epistemic culture. The actors I contacted did not respond to my emails; this was probably also due to the pandemic's consequences. It would have been interesting to consult witnesses from this community. Indeed, the administrative staff can be hypotetically regarded as the *locus* where platforms truly stabilise as an indisputable matter of fact. Such epistemic culture appears indeed – in Weberian terms – as the norm in another form. This suggestion shall be investigated in further research.

7 Among these, five do not work in Sapienza. Their stories were used, together with those of Sapienza's professors, to obtain insight on online teaching during the Covid-19 emergency (§ 7).

8 The organisations employing the consulted IT Specialists are the following: Be Smart (1), Cantieri Informatici (1), CINECA (1), EuroCRIS (1), DSpace-CRIS (1), InfoSapienza (current or former members; 4).

9 As Deborah Lupton argues in the crowdsourced document *Doing fieldwork in a Pandemic* (2020), diaries can be "semi- or unstructured – asking for more free-flowing reflection. Keeping in touch with participants is very important, especially for longer-term studies, as this maintains participation" (p. 4). They can be written, voice memos or via platforms or apps (Elliott,

teaching experience and practices during the 'phase 1' period of the emergency (11 March 2020–4 May 2020; § 7.4). I chose not to provide these consultants with a structured observation grid. Rather, I asked them to collaborate with me as co-ethnographers. This is the invitation I sent to the student co-ethnographers:

> Dear [name of the student],
> First of all, thank you very much! Your contribution will be really important to me :).
> If you feel like it, I would love to read a detailed auto-ethnography of your e-learning experience and practices. Everything that happens and that you 'see' will be interesting to me.
> For each course, please write a few lines for me after each lesson you attend. Do that for a month – keeping a different diary for each course – and send me your diaries from time to time. You can write whatever you feel like. As the only indication, please keep close to these suggestions:
> - which courses you attend;
> - which platforms are used and how they are 'combined' together;
> - which problems are encountered (access, technical, institutional, personal) and which strategies are put in place to bypass or solve them, between backstage and frontstage;
> - between online and offline: what is done offline during an online lesson? What changes between an online lesson and an offline lesson?
> - what changes over time, between the first lessons and those 'ahead'.
>
> For any clarification or questions please contact me whenever you want.
> Thanks again!
> Leonardo

Through the diaries, I could access thick and self-reflexive insights on distance learning experiences by students and professors. This data has been used as background material that has enabled a

1997; Ahlin & Li, 2019). Out of the eight completed diaries, five were sent as text document, and three via weekly voice memos.

greater understanding of teaching practices and interoperability in action in Sapienza (§ 7; § 9).

Finally, through digital ethnography (Pink, Horst, Postill, Hjorth, & Lewis, 2015) I have been able to obtain rich data on online artefacts with diverse degrees of visibility and their use by different users. First, I attended six online lessons (two at University of Cagliari, and four at Sapienza) as a non-participant observer. In addition, following suggestions in recent sociology of education (Landri, 2018), I became both ethnographer and *cyberflâneur* (Hogan, 2016): "the *cyberflâneur* follows 'links of association' (…), much like a *flâneur* could follow a scrap of paper taken to the wind (…) as no matter what traces are followed, all will lead to something worth reporting" (ivi, p. 9, italics in the original text). However, I did not embrace the *flâneur*'s spleen ("if they happen to reach a barrier – the dark web, password-protected sites, pay walls and so on – (…) they will assume these are not worth visiting"; ibidem). Rather, I used various IT methods to uncover what was hidden. I consulted the Internet Archive (2019) to obtain earlier versions of webpages; I analysed the CERIF ontology code searching for comments by the developers; I scrutinised the documentation and GIT code of the CINECA applications. Thereby, I was able to explore European IT standards (§ 9.2.2), the changing and stratified platforms in Sapienza (§ 5), thick background data on how Italian virtual universities are perceived in web forums on such topic (§ 4.3), IT projects for education that are now decaying or disappeared (§ 4), or have become global businesses from small initiatives (§ 3).

2.3.1 The field site: The 'Sapienza' University of Rome

The history[10] of Sapienza is intertwined with that of the city of Rome and, in general, with Italian events from the Middle Ages to

10 Part of this paragraph is based on the page of the official website of Sapienza dedicated to its history (Sapienza, 2020c).

the present day. Its origins are in 1303, when Pope Boniface VIII issued the edict *In suprema praeminentia dignitatis*, founding thereby the Studium Urbis, i.e. the University of Rome. Interestingly, the university was first located outside the walls of the Vatican, in the Roman neighbourhood of Trastevere. Over time, Studium Urbis acquired prestige. However, only in the sixteenth century (with Pope Leo X) it would become famous throughout Europe as a point of attraction for scholars. Across the centuries, Studium Urbis expanded, moved (Sant'Eustachio and Corso Rinascimento), and received new stimulus. In the XVIII century, with Pope Benedict XIV, five degree courses were being taught in Studium Urbis: Sacred Subjects, Law, Medicine and Surgery, Arts and Philosophy, Languages.

With the unification of Italy and the end of the temporal power of the popes, Studium Urbis opened to secularism. After a few decades came the time of nationalisms, which became increasingly visible and radicalised during the period of Fascism. In 1931, all Italian professors were required to swear an oath of loyalty to the Fascist regime. Only twelve dared to oppose it, four of whom were from Sapienza (Ernesto Buonaiuti, Giorgio Levi della Vida, Vito Volterra, and Gaetano De Sanctis). The reward for the subjection to Fascism was the new 'university town' built in the Policlinico area by the architect Marcello Piacentini. After the Second World War, professors who had lost their positions for political or racial reasons were reintegrated into teaching and the direct election of the Rector and other academic positions was restored. In the 1960s, a strong increase in the number of students and their political participation was observed. Strong protests and clashes between factions of students took place recurrently. Concern over the excessive size of Sapienza led to the development of two further important state universities: University of Tor Vergata and Roma Tre, which over the years also reached considerable dimensions.

Today, the university 'Sapienza' of Rome is the largest public,

non-virtual and non-confederate university of Europe[11]. In A.Y. (Academic Year) 2019-2020, it counted 113.494 enrolled students (Sapienza, 2020), 3.311 academics, 2.203 functionaries, technicians and librarians working for the operation of 11 faculties (Sapienza, 2020).

11 The Spiru Haret University of Bucharest is sometimes referred to as the largest university on the European continent (311.928 students enrolled); it is a private university and data is not recent (Universitatea Spiru Haret, 2012). The second largest university in Europe is the Spanish National University of Distance Education, with around 205.000 students enrolled (UNED, 2020). The University of London has about 170.000 students distributed among its 31 confederate institutes (University of London, 2020). Next comes the British Open University (around 168.000 students enrolled in A.Y. 2018/2018; The Open University, 2020), which too is a virtual university. The next university in terms of numbers (and the largest public, non-virtual and non-confederate higher education institution in Europe) is Sapienza.

part II

processes

DIGITAL PLATFORMS IN HIGHER EDUCATION

THE GLOBAL SCENARIO

3

To begin this enquiry, I drew a tentative scenario of the most relevant digital platforms in global higher education. I wandered (§ 2.3) through the websites of platforms manufacturers and clients, and scrutinised scientific papers and internal reports by IT developers and educationalists. I could thereby recognise the heterogeneity in the current scenario of platforms for teaching, learning, research, management in higher education. Online platforms and their quasi-markets (Bartlett & Grand, 1993) in distance higher education expand and diversify: lifelong learners, employees, users with special needs, researchers, homeschoolers, workers transitioning to new jobs, people searching for online life coaches, administrative staff, students looking for online tutors to help them with their homework, young as well as mature students studying for pleasure, etc. These multiple variations refer to a limited number of digital forms constructed by various epistemic communities: computer scientists, library scientists, educationalists.

In this chapter, I focus on four of these forms which are intertwined through shared cultural patterns and events: Current Research Information Systems (CRISs, § 3.1), Enterprise Resource Management Systems (ERPs, § 3.2), Learning Management Systems (LMSs, § 3.3), Massive Online Open Courses (MOOCs; § 3.3.1). Said digital actors have been chosen for their pervasiveness on the academic practices, processes and everyday lives, on the one hand; and, on the other hand, for the poignancy and breadth of their stories, as their journeys span over Europe and America, from the 1970s onwards, bringing together and interweaving epis-

temic communities. I shall thus describe the emergence of these digital forms, their current global diffusion, and the promises they inscribe.

3.1 CURRENT RESEARCH INFORMATION SYSTEMS: Collecting, exhibiting and reporting research activity

In a knowledge management perspective (§ 1.1.1), disorder and breakdowns can burst in organisations when information is not coordinated and harmonic. This condition may occur when relevant data is dispersed among pieces of software that struggle in communicating to each other (i.e., that hardly interoperate, if at all; see § 8). Current Research Information Systems[1] (CRISs) emerged from the communities of information and library scientists in the 1970s as superordinate containers aimed at wrapping together in one place dispersed research information. They consist of infrastructures and offline/online applications for storing, managing and disseminating metadata on research (STOA, 2014; Leiva-Mederos, Senso, Hidalgo-Delgado, & Hipola, 2017). They usually function as tools for Research Information Management, i.e. the aggregation, curation, and utilisation of metadata about research activities (Bryant et al., 2017, p. 6).

Materially, these ends are achieved through interoperation, which is technically defined as a connective ability of heterogeneous pieces of software to 'talk' to each other and work in a coordinated way (§ 8; § 9). Interoperation is expected to take place among heterogeneous sources "to overcome the information islands and to connect them towards a valuable knowledge

1 There is no standard name for this kind of software. In the European area, they are usually referred to as CRISs, i.e. Current Research Information Systems. They are also globally known as Research Information Management Systems (RIMSs) and RISs (Research Information Systems). In the US, Faculty Activity Reporting software are particularly widespread. They focus on professors' activities, including teaching activity and research output (Bryant et al., 2017).

infrastructure" (Jörg, 2006). CRISs embed standard data formats as 'middle-layers' that provide a common description for the R&D domain (e.g., the CERIF format; § 9.1). These data formats are some sort of *lingua franca* constructed and imposed from the outside to enable communication among technologies speaking different languages.

In IT papers, CRISs are narrated as integrated tools for research management, research evaluation, institutional repository, resource administration, knowledge exchange. They are expected to work as junctions for accessing academic work and enabling its management: CRISs should allow users to handle research management, evaluation, dissemination and (collaborative) discussion as well as visualisation. Indeed, some authors place CRISs at the centre (Fig. 3) between knowledge management and production in the context of a model aiming at "a simplification of the overall setting of information supply and management of academic institutions" (Vernooy-Gerritsen, 2009, p. 48).

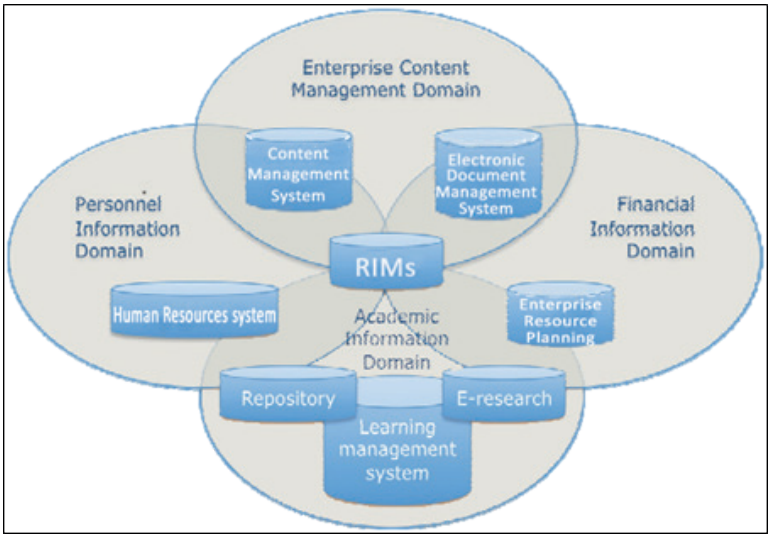

Figure 3. The "information supply and management of academic institutions" (source: elaboration on Vernooy-Gerritsen, 2009)

At the institutional level, CRISs are used as a means for evidence-based decision-making and output-based evaluation as well as logs for research in progress and as tools to assist project planning (STOA, 2014). At the individual level, they are employed for identifying opportunities for research funding, avoiding duplication of research, finding references to full-text publication, identifying new networks and markets, and exhibiting one's research (ivi). CRISs are used to manage homogeneous and heterogeneous data from repositories, databases and libraries (Leiva-Mederos et al., 2017). Hence, they are usually embedded with interoperability capabilities (§ 8; § 9)

Today, CRISs are much used on a global scale. Some CRISs are embedded within higher education institution (e.g., CINECA IRIS; § 5.1), while others are national (e.g., NARCIS.nl or CRIStin.no) or transnational (e.g., OpenAIRE.eu). A 2018 survey carried out by OCLC Research and euroCRIS (Clements, de Castro, & Bryant, 2019) on 381 higher education institutions found that most of the institutions that have implemented a CRIS are in EMEA (31%), followed by Americas (10%) and APAC (8%). More than a third of the surveyed institutions do not have CRISs but are in the process of implementing it, while 16% are not considering this possibility[2] (Fig. 4). Several pieces of software can be used to activate CRISs. Most of such software is closed source, while some is open source (Fig. 5)[3].

The roots of CRISs date back to the 1970s. Attempts to develop international collaboration networks among local information systems stemmed from the strong growth in the scientific literature output. CRIS software focused on bibliographic data.

2 The graph has been recategorised. The categories "Exploring", "Implementing", "Procuring" have been aggregated. The category "Unknown" has been removed.

3 The graph has been recategorised to extract CINECA IRIS from aggregated data.

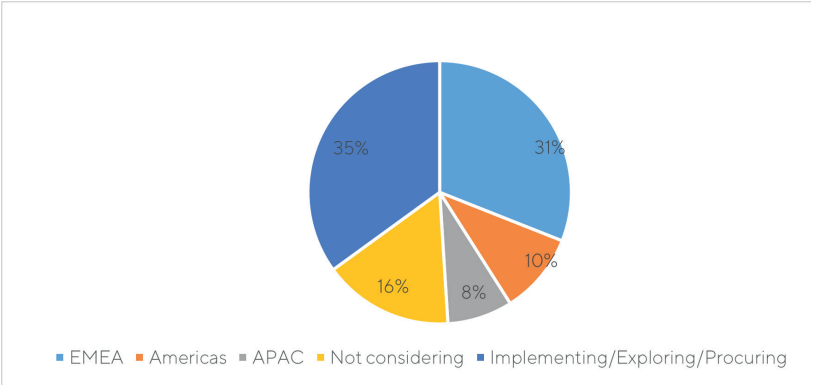

Figure 4. CRIS systems in the world (N = 81; source: elaboration on Clements et al., 2019)

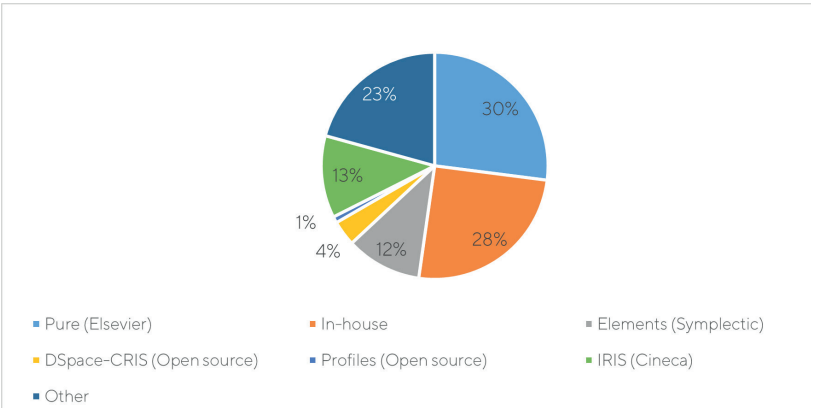

Figure 5. CRIS systems in use (N = 193; source: elaboration on Clements et al., 2019)

Ingegerd Rabow reports on the pioneering work carried out under the auspices of UNESCO and the Smithsonian Institution (2009). At the end of the 1960s, UNESCO and the International Council of Scientific Unions (ICSU) launched a project aimed at coordinating scientific information and integrating it into a World Science Information System. A joint study by these two bodies (UNESCO, 1971) describes a model of academic communication between knowledge producers and users. The project subse-

quently focuses on the exchange between scientists (in particular, practitioners of 'basic' sciences) of relevant literature, standards, procedures and formats. Another pioneering project for the development of CRISs was the Smithsonian Science Information Exchange, which concerned the exchange of information (abstract, funder, budget, researchers, institutions, dates) on research projects in life sciences and physical sciences. Around 1970, almost 100.000 projects per year were added in the Smithsonian Science Information Exchange. In addition, further projects were launched since the 1980s with the aim of building technical infrastructures for transnational scientific collaboration: the European projects CORDIS and IdEAS (Jeffery et al., 1989), the joint American and Japanese project EXIRPTS, the CERIF project by the end of the 1980s (§ 9.1). However, the first CRISs were set up only in the 1990s in Europe as administrative accountability tools for reporting research performances to governments (Fjordback Søndergaard, Andersen, & Hjørland, 2003; Ribeiro, De Castro, & Mennielli, 2016).

CRISs as commercial packages reached the global arena of higher education from the mid-2000s onwards, with Europe as an access point. These products were mainly used in universities and, rarely, in hospitals/medical centres and ministries. Among the most important CRISs in commerce are Elsevier Pure (initially sold as Atira Pure), Symplectic Elements, Clarivate Converis. Atira Pure (Aalborg, Denmark) was released in its first version in 2003 as a repository software. It diffused in Scandinavia first, and then in in Central Europe; its usage grew mainly in the Flemish and German area (Atira A/S, 2009). In 2009-2010, Atira Pure became a major actor in the UK market and was acquired by Elsevier in 2012. It has now customers in the US, UK, Holland, Australia, Denmark. Symplectic was founded in 2003 in England by four theoretical physicists working at their PhD at the Imperial College London. Publications was introduced the same year as a 'publications manager' – still a repository rather than a CRIS. In 2010, Publications

changed its name to Elements and became a CRIS, with Britain as its first market. Today, Symplectic Elements is sold in the USA, too. Avedas was founded in 2005 with its headquarters in Karlsruhe, Germany. In 2013, it was acquired by Thomson Reuters; in 2016, Thomson entered into an agreement to transform Clarivate, its Intellectual Property and Science Business, into an independent entity. It acquired Avedas and renamed it as Converis.

3.2 ENTERPRISE RESOURCE PLANNING SYSTEMS: Managing and intra-connecting higher education organisations

The idea of knowledge management emerged from the field of business (§ 1.1.1). It is not surprising, then, that in such social world technoscience was delegated to reducing chaos in order and connecting fragments. In managerial literature, Enterprise Resource Planning (ERPs) software is defined as a "commercial software package that promises the seamless integration of all the information flowing through the company–financial, accounting, human resources, supply chain and customer information" (Davenport, 1998, p. 121): "one database, one application and a unified interface across the entire enterprise" (Tadjer, 1998). These pieces of software appear as 'one-stop shops': all-encompassing and integrated systems (Markus, Axline, Petrie, & Tanis, 2000), complex mega-packages (Gable, Scott, & Davenport, 1998) that allow the integration of information across different domains for business support. They are closed, proprietary, expensive pieces of software stemming from the managerial and engineering disciplinary communities.

The emergence of ERPs is intertwined with the wider development of networked information communication. The production and consumption of mainframe PCs for business grew enormously in the 1960s and 1970s. Their hardware potential expanded and software was continuously upgraded to exploit it. In

the 1980s, business-oriented research was conducted on how to share data and systems most effectively. From the middle of the decade, Local Area Networks (LAN) were used to share data and peripherals; by the end of the 1980s, Database Management Systems (DBMS) were increasingly used as a single access point for multiple hosts in a network.

Meanwhile, the ancestors of ERPs were already functioning as manufacturing tools since the 1960s and 1970s. Before that, they worked as command-line IT tools for inventory tracking. However, they became more complex and fulfilled the functions of Material Requirement Planning (MRP) and Distribution Resource Planning (DRP). They were inventory management tools that enabled plant managers to plan production and raw material requirements (Kalakota & Robinson, 2001; Wagner & Monk, 2008); working as centralised computing systems, they automated the inventory control system using packages written in COBOL, ALGOL, FORTRAN (Rashid, Hossain, & Patrick, 2002). In the 1980s, the MRPs 'left the factories' (Kalakota & Robinson, 2001) and their usage was extended to several further areas. In 1990, a paper by the research and advisory company Gartner Group kickstarted the idea and the technology underlying Enterprise Resource Planning systems (ERPs). ERPs entered the scene as complex tools, equipped with graphical interfaces, relational databases and other innovations (Sammon & Adam, 2005). According to managerial literature, the 'structural migration' from MRPII to ERP occurred due to a number of factors related to key business drivers and the Y2K bug (Kalakota & Robinson, 2001; Sammon & Adam, 2005). Nowadays, 'ERP II' (Bond et al., 2000) and 'post-modern ERP' (Ganly, Kyte, Rayner, & Hardcastle, 2013) are considered new ideas and practices, both introduced by the Gartner Group.

Some ERPs played a particularly important role in management economics. Oracle Applications was founded in 1987 in Silicon Valley, while SAP R/3 was released in 1992 by five German

engineers working for the US-based corporate IBM (SAP, 2011). PeopleSoft was also based in California, with a focus on business processes and human resources; it was absorbed by Oracle in 2005. Baan ERP was founded in 1989 in Netherland and bought by Infor in 2006. J.D. Edwards (Denver, US) was acquired by PeopleSoft in 2003 and by Oracle in 2006.

Broadly speaking, ERPs have seemingly first reached the big companies, then the medium-sized ones, and finally, only in the late 1990s, the American universities (Hayes & Utecht, 2009). PeopleSoft entered Delaware University in 2000 and Stanford University in 2001; at the end of 2004, it was used in more than 730 universities (Wagner & Monk, 2008). SAP R/3 was introduced at Carnegie Mellon University in 1996 and Central Michigan University in 1998. It also built a 'SAP University Alliance' in the US that was joined by various universities such as Drexel, Carnegie Mellon, Louisiana University. In the early 2000s, several hundred American universities were using SAP R/3 (Targowski, 2006).

3.3 LEARNING MANAGEMENT SYSTEMS: Teaching online through integrated dashboards

In the mainstream literature on education, Learning Management Systems (LMSs) are considered as online software that support teaching professionals in the management of educational courses (Ellis, 2009). Three LMS macro-functions are generally reported: they make it possible for teachers to upload material that students can access; they enable discussion between students and teachers; and they manage testing and evaluation (ivi). Ryan Ellis lists some recommended functional requirements for LMS: they should be integrated with the organisation's human resources system; they should be equipped with administration tools; they should adhere to shared standards; they should be well configurable and secure. Furthermore, a LMS should provide flexibility in access to content (media, methods, languages, etc.) and content should

be developable and integrable. LMSs often incorporate several sub-programmes called Learning Content Management Systems (LCMS); these tools are used to create study materials (which are sometimes standardised in packages called 'learning units') and tests that are then embedded in the LMS.

However, what characterises and distinguishes LMS are not their functions, neither requirements, nor their components. It is rather – again – their systemic, infrastructural and centralising logic: an LMS is "a framework that handles all aspects of the learning process" (Watson & Watson, 2007, p. 28). LMSs, in fact, embody the vision of an integrated digital space through which to manage teaching (ivi).

LMS are rooted in the idea of computer-assisted instruction (CAI) and integrated learning systems (ILSs), i.e. "complex, integrated hardware/software management systems using computer-based instruction" (Bailey, 1993, p. 5). These 'teaching machines' for programmed learning were created in the 1950s by communities of computer scientists and educationalists. They were able to randomly generate problems, adjust the difficulty and sequence of tests basing on student performance, and provide immediate feedback: "[i]n other words, teachers know exactly where students are having difficulties (…); thus, it enables teachers to identify and individualize remediation activities" (ibid.). ILS technologies thus seem to embody a behaviourist vision (Becker, 1992) in which learning is a psychological matter and a solitary performance (Skinner, 1954).

The PLATO machine (Programmed Logic for Automated Teaching Operations; Fig. 6) is a major example of integrated learning systems. According to some authors, it can be considered as the first case of a Learning Management System; such a label would have been coined concerning such technology (Watson & Watson, 2007). PLATO, developed at the University of Illinois in 1960 by the electrical engineer Donald Bitzer[4], was the

4 In 1959, the University of Illinois held weeks of meetings between physi-

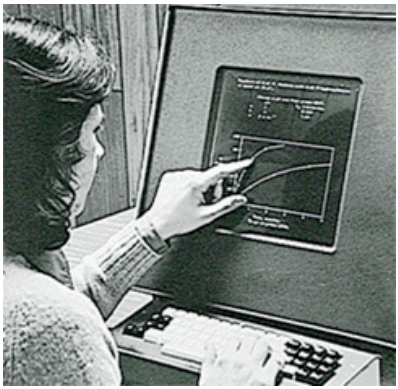

Figure 6. A person using a PLATO system (source: Wikicommons).

first generalised computer-assisted instruction system. PLATO offered teachers the opportunity to design their lessons using the TUTOR programming language (Picciano, 2018). Coursework from elementary to university level was thus provided in a wide range of subjects (mostly hard sciences) through texts with graphics, tests, assessment, feedback. Initially an American-only phenomenon, it then expanded all over the world. The last PLATO system was switched off in 2006. Many modern concepts and visions took shape through PLATO's technicalities and socialities – sometimes beyond the sphere of education: forums, message boards, online testing, e-mail, instant messaging, remote screen sharing, multiplayer videogames.

During the 1990s and the 2000s, the expansion of the market was accompanied by a strong heterogenisation in the demand from institutions, the epistemologies embodied by the producers, the cultural spaces of production with a (still mild) move away from the exclusively American area. This phase of growth was followed by MIT's important Project Athena, a four-year initiative to explore the use of computers for teaching. In 1992, GeoMetrix Data Systems (Victoria, Canada) released the TrainingPartner LMS; in 1997, CourseInfo released Interactive Learning Network at Cornell University in New York; in 1998, Blackboard Inc. in Washington released Blackboard Learn after absorbing CourseInfo; in 1999, ePath Learning in New London released ASAP.

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cists, engineers, mathematicians, psychologists and administrators around the idea of a computerised learning system. No agreement was reached on its design. At that point, the project was entrusted to Donald Bitzer. Bitzer was also to co-invent the plasma screen in 1964.

In 2002, the open source and socio-constructivist LMS Moodle (§ 5.5) was released by the computer scientist and educationalist Martin Dougiamas (Dougiamas & Taylor, 2000) at the University of Curtin, Australia; the first community meeting event (MoodleMoot) took place in Oxford. In 2005, NACON Consulting released VirtualOnDemand, which was oriented towards training; in 2006, OLAT 5.0 was released by the University of Zurich with an emphasis on collaborative aspects; in 2014, Alphabet-Google announced Google Classroom (Mountain View, USA). Today, many modern LMS software is provided as-a-service and in the cloud.

Among the most used LMS today are Blackboard, Instructure Canvas, D2L Brightspace, Moodle, Sakai. Moodle predominates outside the United States, while D2L Canvas and Blackboard Learn compete for the lead in the USA (Fig. 7). As far as the American situation is concerned, in recent years Blackboard Learn has suffered from a decline in popularity in favour of Instructure Canvas. A light decrease can also be observed in the case of Blackboard Learn (Fig. 8).

Through this long process, the very idea of integratedness seemingly underwent transfers and transformations. In ILS technologies, it referred to the relation between software and hardware, while in today's LMSs it is about the mutual relation among different pieces of software. Integratedness therefore appears as a matter of centralisation and interoperability (§ 8; § 9).

3.3.1 Massive Open Online Courses: Free educational resources through Learning Management Systems

The MOOC idea emerged from the Open Education Movement (Yuan & Powell, 2013, 2015). Such movement gathered various communities interested in information technology, learning and freedom of access to knowledge. In 2001, Wikipedia was created; in the same year, the Budapest initiative established principles for free access to scientific literature. In 2002, MIT launched its OpenCourseware initiative for Open Educational Resources

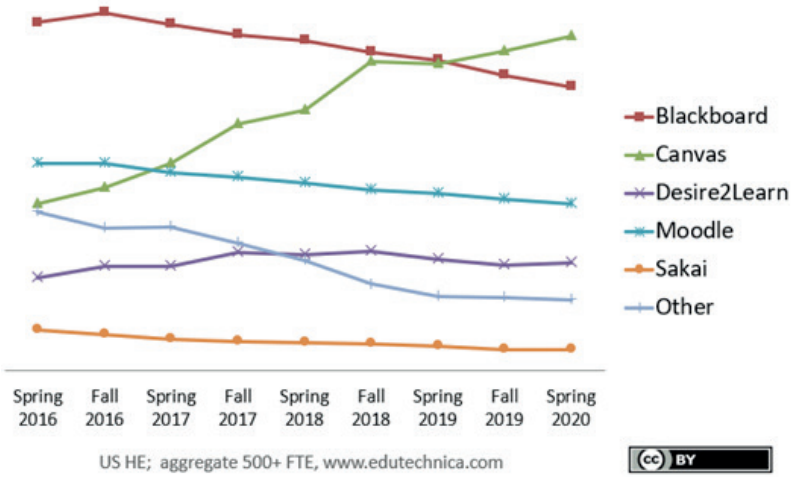

Figure 7. The most used LMSs in the US (source: edutechnica.com)

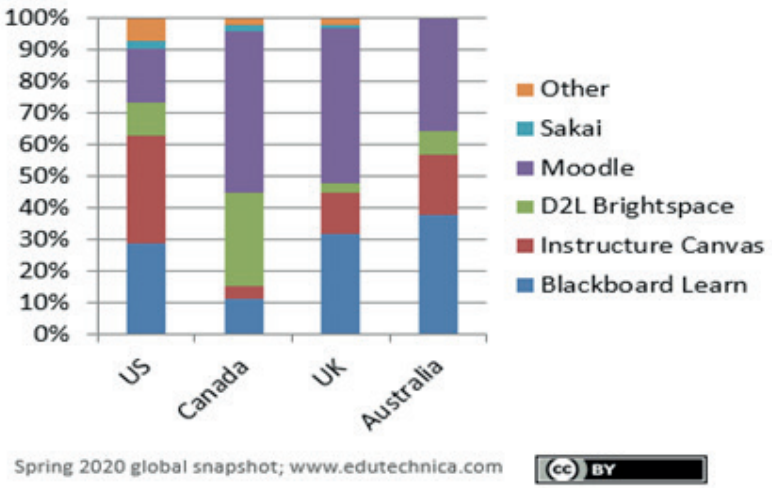

Figure 8. Spring 2020 global snapshot of LMSs use (source: edutecnica.com)

(OER), and in 2002 Creative Commons was born. In 2006, the English Open University launched the OpenLearn project which released freely downloadable and adaptable Open Education Resources.

The term MOOC was introduced in 2008 by the educationalist Dave Cormier to describe the course 'Connectivism and Connective Knowledge' held by George Siemens and Stephen Downes at the University of Manitoba. It was designed and conducted for 25 paying students and 2300 non-paying learners. The students were able to participate through their preferred tools: discussions on Moodle, Second Life, synchronous online meetings, blog posts. From then on, MOOCs quickly expanded. The year 2012 was defined in the New York Times as "[t]he year of the MOOC" (Pappano, 2012) as supply and demand quickly arose: new platforms based on different types of educational paradigms and business models were developed and continued to grow.

The two main pedagogical models in MOOCs are the connectivist model (cMOOCs) and the content-based model (xMOOCs). cMOOCs are based on the connectivist learning theory that emphasizes learning as a collective process between like-minded peers (Yuan & Powell, 2013). Students learn in collaborative environments and are autonomous in the choice of the contents they wish to interact with and the tools to use (Porter, 2015). xMOOCs, on the other hand, are supported by a behavioural epistemology and a transmissive model (ivi). Learning happens as an individual endeavour and through "'drill and grill' instructional methods with video presentations, short quizzes and testings" (Yuan & Powell, 2013, p. 7).

cMOOCs are mainly associated with the founding institutions of the MOOC idea such as the Abathasca and Manitoba Universities in Canada, or with innovative small-scale experiments. They have almost disappeared by now. xMOOCs are hosted on the LMSs of big commercial platforms providers (edX, Udacity, Coursera, etc.).

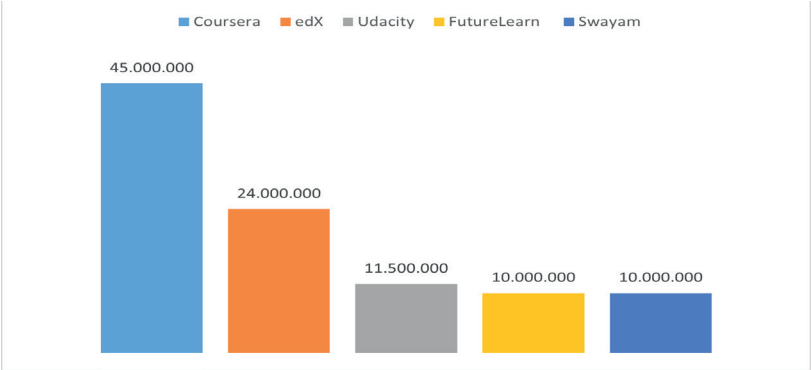

Figure 9. The top five MOOCs providers in 2019 by students enrolled (source: ClassCentral, 2019)

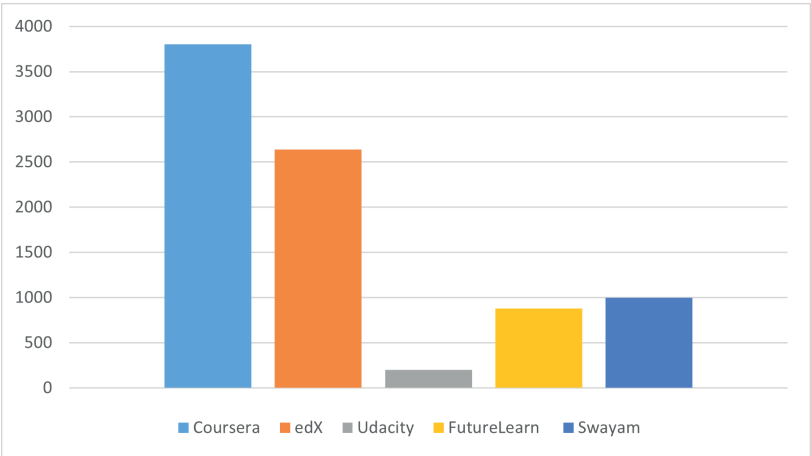

Figure 10. The top five MOOCs providers in 2019 by courses delivered (source: ClassCentral, 2019)

The business model of large commercial xMOOCs is based on their role as "connector[s] in a multisided market, connecting content, students and third parties" (Van Dijck et al., 2018, p. 152). Universities (i.e., the supply) produce the content, while students (i.e., the demand) consume the content. MOOCs platforms are rewarded for their 'connective' services between universities and students: "Just as Uber has no cars and employs no drivers, Coursera employs no teachers and owns no school buildings" (ibid.).

Any profits from fees for access to lessons must then be shared by the universities with the MOOCs. In addition to the predominant 'free' model, there are also 'premium' variants: paid certifications, proctored exams, etc. (ibid.).

According to ClassCentral, 110 million students were registered at MOOCs in 2019, with the exclusion of China, and more than 900 universities delivered around 13500 courses (Fig. 9 and Fig. 10) (ClassCentral, 2019). The most important providers are from the US (Fig. 10): Coursera, edX, Udacity, Udemy, Khan Academy, P2PU, Kadenze. Other MOOCs are available through European platforms such as OpenUpEd or IVersity, through the British platform FutureLearn, or through the Australian Open-2Study. New and relevant MOOCs are emerging in the Asian area, e.g. Swayam, India's national MOOC.

★ ★ ★

In this chapter, I have made an attempt to trace the stories and some traits of the main forms of digital platforms in contemporary global higher education. Current Research Information Systems (CRISs), Enterprise Resource Management Systems (ERPs) and Learning Management Systems (LMSs) are inscribed with different targets, but share common stories. They are the complex consequences of the changing relations among disciplinary communities (computer scientists, librarians, educationalists), artefacts (computers, software), epistemologies (behaviourist and connectivist) that have been crossing US and Europe since the 1970s. Also, they all seem embedded with the desire of transforming disconnected mess (Fig. 11) into integrated whole (Fig. 12).

Figure 11.
The first figure in Thomas Davenport's *Putting the enterprise into the enterprise system* (1998): "If you're not careful, the dream of integration can turn into a nightmare"

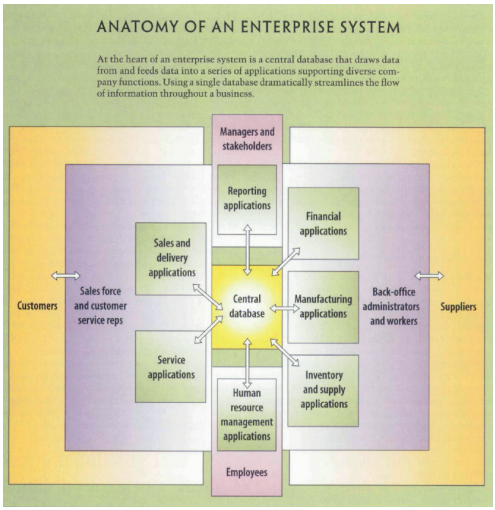

Figure 12.
The second figure in Thomas Davenport's *Putting the enterprise into the enterprise system* (1998): "Anatomy of an enterprise system"

Discontinuous and complex information is thus integrated and harmonised in unitary, systemic and centralised infrastructures. This is a generic behaviourist promise based on knowledge management assumptions: an attempt to break down multiplicity, purify complexity, extract order from chaos (Latour, 1991). In the next chapter, this process of platformisation between technology and society shall be focused with regard to the specific case of Italian higher education.

THE PLATFORMISATION OF HIGHER EDUCATION IN ITALY

THE CO-SHAPING OF TECHNOLOGY AND SOCIETY THROUGH DIGITAL PLATFORMS

4

In the previous chapters, I analysed digital artifacts travelling in global spaces. In this chapter, I propose a tentative description of the processes of platformisation (§ 1.1.2) of technology and society that are occurring in the field of higher education in Italy (Poell, Nieborg, & van Dijck, 2019; Piromalli & Viteritti, 2019). Online platforms shall thus be observed as mediating agents within broad processes of mutual transformation and continuous translation of technical and social processes (Van Dijck et al., 2018).

I have collected four stories to provide a provisional representation of the processes of platformisation. These short and necessarily incomplete stories aim at narrating the intertwining and co-transformation of technology and society around online platforms in the context of Italian higher education. They focus on the CINECA inter-university consortium (§ 4.1) which develops platforms for higher education management as a hybrid public/private, state/market actor; the expansion of Italian *università telematiche* (§ 4.2) which suggest new learning arrangements and processes of societal depoliticisation beyond the *forme scolaire*; the MOOCs market in Italy (§ 4.3) between standardisation through public policies and marketisation triggered by private global actors; and the emergence of distance teaching in Italian higher education (§ 4.4), which comes with a transformative interweaving of software, policies, discourses, practices, markets, institutions.

It is not possible to distinguish sharply between technical and social aspects (Orlikowski, 2002; Law, 2004a). For this reason, these four stories proceed by interweaving sociotechnical aspects in or-

der to describe the co-shaping of technology and society through platforms. The beginning of each of them shall be arbitrary, "but we see a point in beginning just there, because it is a narrative, a story that we want to spin" (Czarniawska & Joerges, 2011, p. 10).

4.1 THE CINECA CONSORTIUM: A public/private and technical/political actor/network

One of the trajectories followed by the platformisation of Italian higher education concerns the field of digital management of academic organisational processes. This is a fragmented and complex arena where public and private actors, digital software (ERPs, CRISs, etc.) and markets entwine.

This story can be told by following three important Italian inter-university consortia of the 1990s: CASPUR[1], CILEA[2] and CINECA[3]. CINECA was the most technologically developed. It was founded in 1967 by the Rectors of four North-Italian Universities (Bologna, Padua, Florence, and Venice) to provide information systems. It gradually expanded across scales (regional, national, global) and sectors of action. In 1969, CINECA hosted the first supercomputer available in Italy. In the 1980s, it became an important node for national and international academic networks, such as the GARR (the data transmission network for Italian scientific research) and the EARN-BITNET (which connects more than 500 sites in 15 European and North American countries).

1 Consorzio interuniversitario per le Applicazioni di Supercalcolo Per l'Università di Roma (Interuniversity Consortium for Supercomputing Applications for the University of Rome).

2 Consorzio Interuniversitario Lombardo per l'Elaborazione Automatica (Lombardy Inter-University Consortium for Automatic Calculation).

3 Consorzio INteruniversitario pEr il Calcolo Automatico dell'Italia Nord Orientale (Interuniversity Consortium for the Automatic Calculation of North-Eastern Italy).

In the early 2000s, the three consortia were very active in developing software for Italian universities. CILEA paved the way for the digitalisation of Italian higher education with its CRIS SURplus (Sistema Universitario Ricerca Plus), developed in 2004 (Mornati, 2012). In the same year, CINECA began the development of the U-GOV ERP, which also included a module that functioned as CRIS (U-GOV Ricerca; § 6.1). U-GOV quickly became a major player in the Italian universities. In 2012, under Minister Francesco Profumo, for reasons of cost rationalisation the three consortia were merged into a single entity which kept the name CINECA (Galimberti, 2014). In 2007, CINECA decided to maintain U-GOV as ERP, and to split from it the CRIS functionalities. The new CRIS, named IRIS, was developed from 2013; CINECA intended to convey in IRIS the best-of-breed of U-GOV Ricerca by CINECA and SURplus by CILEA. As will be shown, IRIS is one of the most important and used platforms in the Italian higher education.

CINECA[4] thus emerged as a key player out of this process of

4 In April 2020, CINECA was formed by MIUR, ANVUR, 69 universities, 8 research centres, 2 university hospitals. The universities that participate to the consortium are Bari, Politecnico di Bari, Basilicata, Bergamo, Bologna, Libera Università di Bolzano, Brescia, Cagliari, Calabria, Camerino, Catania, Chieti, Cassino e Lazio Meridionale, 'Magna Græcia' di Catanzaro, Ferrara, Firenze, Foggia, Genova, L'Aquila, IMT Istituto di Studi Avanzati di Lucca, Macerata, Messina, Milano, Milano Bicocca, Politecnico di Milano, Modena e Reggio Emilia, Molise, Napoli Federico II, Napoli L'Orientale, Napoli Parthenope, Università degli Studi della Campania 'Luigi Vanvitelli, Padova, Palermo, Parma, Pavia, IUSS di Pavia, Perugia, Università per stranieri di Perugia, Pisa, Normale di Pisa, Sant'Anna di Pisa, Politecnica delle Marche, Mediterranea di Reggio Calabria, Roma Foro Italico, Sapienza Università di Roma, Roma Tre, Roma Tor Vergata, Salento, Salerno, Sannio, Sassari, Siena, Università per stranieri di Siena, Teramo, Torino, Politecnico di Torino, Trento, Trieste, Scuola Internazionale Superiore di Studi Avanzati di Trieste - SISSA, Udine, Urbino, Valle d'Aosta, Insubria (Varese), Venezia, Iuav di Venezia, Piemonte Orientale (Vercelli), Verona, Tuscia (Viterbo), Gran Sasso Science Institute (GSSI). The research centres are Consiglio Nazionale delle Ricerche – CNR, Istituto

digitalisation of the Italian higher education management processes. It is now one of the most important Italian actors for high-performance computing and the informatisation of higher education. Also, CINECA maintains close bonds with the MUR. It has been developing software for the Italian education sector since the late 1990s: an e-voting system for university staff recruitment (1999), a Student Management System (ESSE3, 2001), a digital Student Registry Office (Anagrafe degli Studenti, 2004), a personal website for Italian researchers to manage their careers (LoginMIUR/Sito docente, 2007) – among which, as mentioned, the U-GOV ERP (2004) and the IRIS CRIS (2013).

CINECA is seemingly moving toward an entrepreneurial path. In 2008, it has become a private legal entity subjected to the tax regulations of commercial entities; in 2001, it has been registered in the Milan Companies Register. Moreover, from 2017 until 2018, the MIUR has provided CINECA with a share[5] of the public Ordinary Financing Fund (FFO). Today, the CINECA Consortium includes public and private universities (e.g., Bocconi, Cattolica, IULM, etc.), as well as state agencies such as ANVUR and MIUR. These bodies participate in the consortium and receive CINECA services in exchange for financial resources. Negotiations among the consortium members are based on CINECA's in-house pro-

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Nazionale di Documentazione, Innovazione e Ricerca Educativa - INDIRE, Istituto Nazionale di Astrofisica – INAF, Istituto Nazionale di Fisica Nucleare – INFN, Istituto Nazionale di Ricerca Metrologica – INRIM, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale – OGS, Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione – INVALSI, Stazione Zoologica 'Anton Dohrn' – SZN. The university hospitals are Azienda Ospedaliera Universitaria Università della Campania Luigi Vanvitelli, Azienda Ospedaliera Universitaria Policlinico Paolo Giaccone, Palermo (CINECA, 2020a).

5 The average annual amount from 2007 to 2018 was EUR 25.370.472,916, split between supercomputing services and services to the MIUR (UR 14.000.000). Since 2019, only the share for supercomputing services has been given, i.e. EUR 13.000.000.000 (MIUR, 2019).

viding model. As long as CINECA operates in public services only, the consortium members can proceed through direct entrusts instead of issuing public tenders. However, between 2009 and 2011, the consortium received 95% of its revenues by private actors (private higher education institutions, industrial companies, other administrations) for commercial services. Only 5% of its incomes came from institutional orders by public consortium bodies such as higher education institutions, MIUR, and ANVUR (Il Fatto Quotidiano, 2014). Several opinions from the Italian Authority for communications guarantees (AGCOM) and rulings of the Regional Administrative Courts and the Council of State have therefore sanctioned the illegality of CINECA's in-house character, due to its mix of institutional and commercial production.

CINECA appears to take a hybrid stance on the governance level as well. It is not only a technical entity that provides IT services to its partners. As a consortium body, CINECA has been arranging, coordinating, and setting up a policy network and an arena where public and private, state and non-state actors of the Italian higher education meet and test their alignments. CINECA thus emerges as a political space and obligatory point of passage for the informatisation of higher education in Italy (Piromalli, 2019), as it provides resources to work as an academic, manage universities, introduce new platforms, etc. Higher education administration and research in Italy are almost exclusively governed by CINECA through its CRIS and ERP platforms (U-GOV and IRIS). CINECA also deals with the public issues of evaluation and career management (LoginMIUR; Grimaldi et al., 2020), research through open data (National Register of Students), the guidance of students from high school towards higher education (Universitaly; Borrelli et al., 2017), etc.

The platformisation of the digital management of higher education in Italy is thereby seemingly translated and mediated by CINECA. This process occurs through the mutual transformation and interweaving of digital forms for the governance of higher

education, the emergence of hybrid forms, and the reorganisation of the relationships between public and private. CINECA takes the form of a boundary actor: acting as an edtech network (Williamson, 2019), it knots together multiple modes of action (public and private, technical and political, actor and network) thereby producing mixed forms of governance in which heterogeneous actors coexist and market spaces are opened in previously State-owned territories. The issue of (digital) education is thereby unravelled in its deep enmeshment with political and social concerns.

4.2 VIRTUAL UNIVERSITIES IN ITALY: Learning arrangements and societal depoliticisation beyond the *forme scolaire*

The platformisation of higher education in Italy also concerns virtual universities, which are locally known with the legal name of *università telematiche*. In this case, platformisation sews together technologies for lifelong learning and processes of marketisation in higher education.

Virtual universities are broadly considered as mostly private institutions providing distance higher education through electronic media (Cornford & Pollock, 2003; Ryan, Scott, Freeman, & Patel, 2000). The first virtual university was the Open University, founded in England in 1969, which broadcasted its content through television, radio and, later, the internet. Online higher education exploded in the late 1990s in the USA with the full-scale emergence of the internet. In terms of transcalar policy, distance education became an object of interest for the European Commission through policies on eLearning (28/03/2001 and 13/08/01) and lifelong learning (11/11/01). Today, virtual universities are active on varied institutional levels: intergovernmental (e.g., African Virtual University, Academy of EU Law, EUCLID); national (e.g., Canadian Virtual University, Virtual University of India, Virtual

University of Pakistan); non-governmental/state (e.g., *università telematiche* in Italy).

As to Italy, *università telematiche* (UTs) are non-state universities which provide formal higher education and issue educational qualifications with legal value on the national territory. Unlike offline/blended universities, teaching activity is almost entirely carried out online; conversely, exams are usually performed offline. To operate, UTs must comply with various national quality assurance standards imposed by MIUR and ANVUR. Also, they must undergo policy procedures such as an initial accreditation, an assessment and a periodic accreditation.

In September 2020, 11 of the 97 Italian higher education institutions are UTs (Table 1). The 6.60% of the 1,721,790 students enrolled in Italian higher education institutions during A.Y (academic year) 2018/2019 were enrolled in UTs. Also, 1.689 professors work in UTs (1,20% of the 115.353 professors working in the Italian higher education).

Table 1. Students enrolled in *università telematiche* (source: MIUR, 2020)

UNIVERSITÀ TELEMATICA	STUDENTS ENROLLED (A.Y. 2018/2019)
Niccolò Cusano	24.244
Leonardo da Vinci	81
e-Campus	15.212
Giustino Fortunato	947
Italian University Line	133
Guglielmo Marconi	9.747
Mercatorum	2.700
Pegaso	39.282
San Raffaele	5.470
UniNettuno	13.429
Unitelma Sapienza	2.419
TOTAL	113.664

Enrolments in offline/blended universities dropped from 1.784.720 to 1.608.126 in the period from A.Y. 2010/2011 to A.Y. 2018/2019, while UTs enrolments expanded from 39.878 to 113.664 (Fig. 13; Tab. 2). The rate of change for UTs for that period is thus 285,03%, while offline/blended universities have decreased by 90,11%. The Covid-19 pandemic might lead to changes in these trends. A simple linear interpolation of the data would show a further growth in the number of enrolments in telematics universities with a concomitant stabilisation, or even a reduction, of enrolments in offline/blended universities. This would open further spaces for quasi-markets and pluralisation of actors in the sphere of Italian higher education (Giancola & Piromalli, 2020).

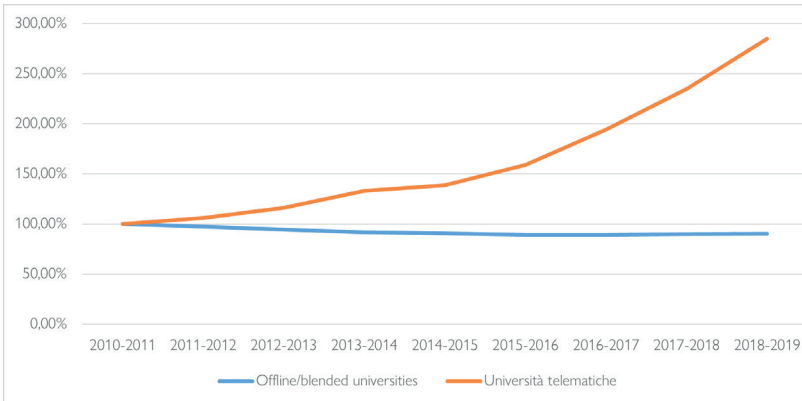

Figure 13. Rate of variation against A.Y. 2010/2011 for students enrolled in *università telematiche* and offline/blended universities (source: elaboration on MIUR, 2020)

As to teaching, a considerable difference can be observed between offline/blended universities and UTs in terms of the number and distribution of qualifications. In particular, the UTs' academic staff is mostly (85.90%) composed of unstructured staff – i.e., *professori a contratto* (roughly, adjunct professors) and *ricercatori a tempo determinato* (fixed-term research assistants) – against the 50.94% of offline/blended universities (Tab. 3). The untenured

Table 2. Students enrolled in Italian offline and blended/virtual universities and variation against A.Y. 2010-2011 (drawn from Giancola & Piromalli, 2020)

	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Offline/ blended total enrolled	1.784.720	1.741.561	1.684.658	1.639.834	1.614.545	1.591.265	1.593.109	1.602.077	1.608.126
Offline/ blended variation vs 2010/2011	-	97,58%	94,39%	91,88%	90,46%	89,16%	89,26%	89,77%	90,11%
Virtual univ. total enrolled	39.878	42.320	46.343	53.054	55.272	63.410	77.530	93.651	113.664
Virtual univ. variation vs 2010/2011	-	106,12%	116,21%	133,04%	138,60%	159,01%	194,42%	234,84%	285,03%
OFFLINE/ BLENDED + VIRTUAL UNIV. TOTAL ENROLLED	1.824.598	1.783.881	1.731.001	1.692.888	1.669.817	1.654.675	1.670.639	1.695.728	1.721.790

and 'pure research' figure of *assegnisti di ricerca* (post-doc researchers) is basically absent from UTs (0.59%), while adjunct professors constitute almost the whole staff. These unstructured 'expert' professionals are among the most vulnerable in the Italian academy (De Angelis & Grüning, 2019). The peculiar distribution of staff observable in UTs is matched by a pluralisation in the professionalities they request: professors, disciplinary tutors (who carry out activities in virtual classes), degree programme tutors (with guidance and monitoring functions), and technical tutors (with technical support functions). These figures are regulated by ANVUR (DM 6/2019) and differently named in the various universities.

Table 3. Distribution of the academic staff in Italian offline/blended universities and *università telematiche* (source: MIUR, 2020)

	OFFLINE/BLENDED UNIVERSITIES		*UNIVERSITÀ TELEMATICHE*	
	Qualification N	Qualification %	Qualification N	Qualification %
Professore a contratto (Adjunct professor)	26.537	28,1	1.220	72,23
Assegnista di ricerca (Post-doc researcher)	14.099	14,93	10	0,59
Ricercatore a tempo determinato (Fixed-term researcher)	7.470	7,91	221	13,08

	OFFLINE/BLENDED UNIVERSITIES		*UNIVERSITÀ TELEMATICHE*	
Ricercatore a tempo indeterminato (Research fellow)	12.560	13,3	37	2,19
Professore associato (Associate professor)	20.625	21,84	157	9,3
Professore ordinario (Professor)	13.146	13,92	44	2,61
Average number of professors per university	94.437	100	1.689	100
TOTAL	1098,10		154,36	

An average of 1.098,10 professors (with a strong variance) is employed in each of the 86 Italian offline/blended universities. In UTs, an average of 154,36 are employed per university. This striking difference is legally allowed by Ministerial Decrees 987/16 and 06/19, which impose fewer constraints on virtual universities. The average load of students per university differs between the two, but not as largely: 18.699,14 per offline/blended university, and 10,33 per UT. The scarce number of professors in the UTs might thus lead, at least over time, to an increase in the workload per professor.

As to online teaching, UTs use *ad hoc* LMS platforms. In some respects, their interfaces recall MOOCs' (§ 4.3.1): course description, training objectives, video lessons, assessment exercises are present. Further elements are related to the students' careers (course plan, agenda, recordings, etc.) and the collective dimension of the UTs' courses (chat during courses, virtual classrooms in a 'Second Life' style, etc.). These platforms are for the vast majority proprietary, i.e. created around specific UTs. Exceptions are, for instance, UniTelma, which uses the CINECA L2L solution, and Italian University Line, which uses Be Smart's GOMP (§ 6.3) together with a proprietary application. These platforms are accessible from any type of device and allow learning at any time and in any place.

A frantic regulatory activity has been carried on around UTs since the end of the 1980s. This has led to the overlap between different regulatory sources and to an intricate and ambiguous jurisprudence (MIUR, 2013). Law 166/1989 is a regulatory starting point, as it paved the way for the autonomy of state and non-state universities. A further step was Law 341/1990, which allowed universities to carry out "distance higher education initiatives". Presidential Decree 30/12/95 (Approval of the University Development Plan for the three-year period 1994-96) contained measures for the development of consortia for distance university teaching. However, the turning point was DM 17/04/2003 (Moratti-Stanca Decree), which introduced criteria and procedures for the accreditation of UTs. UTs thereby emerged as a policy issue, a nexus of educational and organisational practices as well as a formal education/lifelong learning option. All current UTs sprung from the private higher education market between 2004 and 2006. In 2006, the establishment of new UTs was blocked until a regulation setting out the criteria and requirements for accreditation would be approved (Law 286). In 2013, a special MIUR commission detected several serious weaknesses in the law regulating UTs. Gradually, more specific criteria and procedures

for UTs have been introduced with Decrees 987/16 and 06/19; the latter has implemented Law 286/200, after 13 years. In 2019, eight UTs have been funded through the public FFO funding[6].

A process of societal depolicitisation (Burnham, 2001; Wood & Flinders, 2014) of higher education is produced as responsibility for higher education is ~~dislocaed~~ from the public to the private sector. Within this deregulatory activity (which is carried out by public actors), a 'depoliticised space' is proactively (d'Albergo & Moini, 2017) open around the issue of distance education in higher education (Giovanelli & Piromalli, 2019). This space is inhabited by market actors with entrepreneurial logics and scales of action. An interesting case, for example, concern the Multiversity Group by Danilo Iervolino, CEO of the Pegaso and Mercatorum UTs – which are, respectively, the largest UT in Italy and a public-private partnership by Multiversity and the Italian Chambers of Commerce. In 2019, 50% of Multiversity was acquired by CVC Capital Partners (CVC, 2019), a British financial company that currently manages around 52 billion dollars.

In the UTs' case, therefore, platformisation appears as a mutual and continuous transformation between technologies, everyday life, State and the market. On the one hand, UTs produce effects as educational phenomena. They suggest hybrid learning arrangements in which materialities, spatialities and temporalities are woven together and performed otherwise (Fenwick, 2015): online learning can be enjoyed wherever, whenever, however learners wish – beyond the conventional *forme scolaire* (Vincent, Lahire, & Thin, 1994). UTs thus lure users looking for a tailor-made educational offer: workers, parents, travellers, people with disabilities, etc. On the other hand, processes of societal depoliticisation of education become visible in which responsibility for higher education shifts from the public to the private sector. This expands

6 These UTs are Marconi, UniNettuno, San Raffaele, Fortunato, UniTelma, Cusano, eCampus, IUL. In total, UTs have received a funding of € 1.700.000 in 2019 (MIUR, 2020).

the field of education choice, with the entry of new actors into a quasi-market field (Bartlett & Grand, 1993).

4.3 MOOCS IN ITALY: Public regulation and marketisation

The platformisation of higher education in Italy also encompasses the local story of Massive Online Open Courses, in which public regulation, edtechs and educational markets interweave.

As to Open Educational Resources, i.e. publicly reusable and editable digital educational materials (Cesareni, Cosmelli, Fiore, Micale, & Nicolò, 2014; Ghislandi, 2014), the Federic@ platform at the University Federico II of Naples might identified as one of the most pioneering experiences. At its launch in 2007, Federic@ functioned as a weblearning service (De Rosa & Landri, 2012) providing a curated collection of information on several topics.

Full-fledged MOOCs reached Italy around 2013 only. The first experience was run by UniMarconi virtual university, which hosted some courses on its proprietary platform. The year 2014 was the 'year of MOOCs' in Italy, with a two-year difference over the US. Sapienza was the first university to offer MOOCs[7] (§ 3.3.1), as well as the first to join the Coursera MOOC platform which was founded by professors from the Stanford University in California. The non-state Bocconi university in Milan joined Coursera immediately afterwards. The same year, Politecnico di Milano – which is one of the main hubs of higher education digitalisation in Italy – launched Polimi Open Knowledge (POK) – its own MOOCs portal based on the EdX platform developed by the MIT and Harvard universities. UniNettuno – a non-state

7 There was a course by the Department of Architecture History, Design and Restoration (Early Renaissance Architecture in Italy: from Alberti to Bramante), one by the Department of Physics (The world vision of relativity and quantum mechanics), one by the Department of Science of Antiquity (Recovering the Humankind Past and Saving the Universal Heritage).

università telematica (§ 4.2) – hosted some courses using its custom platform. Some universities (Catania and Urbino) used YouTube to deliver MOOCs, while others preferred Moodle (Tor Vergata and Ferrara). Padua and Foggia chose the German platform IVersity. In 2015, Federic@ launched a custom proprietary platform and became a MOOC provider for the Federico II courses, thus becoming the main public platform for online courses in Italy; from 2018, it grew into an aggregator for courses from other external universities. In 2014, the EduOpen MOOC project started. EduOpen is an "academic" (Limone, 2016) MOOC platform providing open higher education resources. It was launched as a MOOCs aggregator by a network of Italian higher education institutions with financial support from the MIUR. It constitutes a network of public (e.g., MIUR; GARR) and private actors (e.g., CINECA, which offers the technological infrastructure; Blackboard; Paperlit). At the time of writing (November 2020), EduOpen hosts more than 300 courses, with a total of 84000 students, 25 institutions, 260 teachers and tutors. It provides different services: guidance for high school students, teacher training, masters, business training, lifelong learning for every type of learner (Fig. 14).

In 2015, the MIUR approved the financing of the EduOpen MOOC project that was submitted the year before by 14 Italian universities. EduOpen was officially launched in 2016 and became a partner of the European Association for Distance Teach-

Figure 14. "What kind of course are you looking for? Guidance. For teachers. Masters. Lifelong learning" (source: screenshoT by the author on https://www.eduopen.org; last access: November 2020)

ing Universities (EADTU). In 2017, EduOpen was accredited for teacher training and co-founded the European MOOC Consortium (EMC). In 2018, the EMC submitted a position paper at the EHEA Conference about "the integration of MOOCs in the Bologna Process" (2018). The EduOpen network successfully enrolled the MIUR in its project and connected to various European networks working on open education.

Hence, on the one hand, the platformisation of the Italian higher education – the continuous translation between technology and society mediated by platforms – is seemingly happening as a slow standardisation process through policies and institutional constraints. On the other hand, together with the persistence of proprietary and open source solutions, new economic actors are infiltrating the Italian arena. These are big players and edu-businesses that cut across scales (Coursera, EdX) and contribute to the establishment of a MOOCs market in Italy.

4.4 DISTANCE TEACHING IN THE ITALIAN HIGHER EDUCATION: Software, policy, markets, discourses, practices

The platformisation of higher education in Italy also concerns the issue of distance learning. This issue has crossed policies and practices for the last thirty years through technical and social mediators, without having reached a real stabilisation yet. Today, the theme appears fragmented – at least on the symbolic level – around the label '*Didattica a Distanza*' (DaD), i.e. distance teaching; however, it may find a new density after the Covid-19 pandemic.

At the policy level, the first manifestation of interest was Law 341/90 on university autonomy, which allowed universities to set up 'distance higher education initiatives'. It was followed by the approval of the university development plan for 1991-93 (DPR 28/10/1991), which set up interventions for technological innovations and distance teaching (art. 2).

The first technical translations of distance teaching took place at the beginning of the 1990s: experiments at the University of Milan with radio/TV links (1991), a course at the Department of Information Science through Internet Relay Chat (IRC) coordinated by Giuseppe Baschieri and Fabio Palladini (1992), the DSI Teleteach Gopher archive with projects and experiences on distance education, packages for computer-based teaching, information about courses, the World Wide Information Board, various audio and video applications (Calvani, Sorzio, & Varisco, 1997; Costa, 1993). In this first phase, IRC, ISDN (ivi), BBS/forum were used as technologies for distance teaching (Cesareni, Ligorio, & Pontecorvo, 2001; Olimpo & Trentin, 1993).

On the discursive level, these experiences were supported by the watchwords '*telematica*' (telematics) and '*teledidattica*' (e-learning; ivi). These projects were mainly carried out by epistemic communities with pedagogical background and socio-constructivist sensitivity (Calvani et al., 1997). Great attention was in fact devoted to peer interaction and tutorship (Trentin, 2003).

The year 1996 marked a new commitment to digital technologies in Italian policy. E-mail messaging made its entrance into classrooms (Trentin, 1996) as proper financial funding was provided. The following year, the CommUnicO distance teaching ex-

Figure 15. The landing page to CommUnicO (source: screenshot by the author through Internet Archive; last access: November 2020)

perimentation was launched (2003). CommUnicO was a virtual course in New Media at the University of Turin in collaboration with IBM, Telecom, City of Turin, Turin 2000. It was a virtual university environment which aimed at simulating the main spaces of interaction within an offline university (Fig. 15): the classroom, which was a (collaborative) learning environment; the library, featuring various resources; the multimedia room, equipped with manuals, guides, software to navigate the Internet; and the secretariat, a service area for deadlines and evaluations. Each environment was characterised with a particular colour to facilitate orientation.

After this phase of experimentation in policies and technology, distance teaching began to become a stable practice. In the early 2000s, the LMS Moodle (§ 3.3; § 5.5) emerged in the Italian higher education, with the first users conference (MoodleMoot) in Rome in 2006 and further every year. Universities as well as schools in various regions participated to such events.

These processes of platformisation do not occur in a vacuum; rather, they are connected to wider processes of rearrangement on the global level. At the beginning of the new millennium, along the lines of the Lisbon Strategy, the EU engaged with issues of eLearning and Lifelong Learning. In 2001, the European Commission published the *eLearning Action Plan: Designing tomorrow's education*. eLearning is defined as "the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration" (European Commission, 2001, p. 2). In 2003, the European Parliament issued a resolution about a multiannual program (2004-2006) for the integration of a *eLearning Programme* (P5_TA(2003)0441). It proposed the effective integration of information and communication technologies (ICTs) in education and training systems in Europe. These initiatives were part of a broader eEurope Action Plan (COM(2000) 330, 14.06.2000) which aimed at enabling Europe to exploit its

strengths and overcome the barriers holding back the uptake of digital technologies. On the front of lifelong learning, the most important initiative in 2001 was Making a European Area of Lifelong Learning a Reality (COM(2001) 678).

Marco Santagata and Mirko Tavoni, at the beginning of the new millennium, summarised as follows some of the characteristics of e-learning processes and practices: "local and sectoral initiatives (…) undersized (…) an extension of traditional teaching practices (…) isolation (…) backwardness" (2001, 924-925, translation by the author). According to the authors, online teaching was still being interpreted as an extension of transmissive teaching: the forms and characteristics of open and distance learning had not yet been metabolised by teachers and stakeholders. After almost 20 years, the situation does not seem very different (Giancola & Piromalli, 2020), although scholars are observing a growing drive towards innovation as well as the emergence of several initiatives for distance learning, especially from below (Viteritti, 2009, 2014; Viteritti & Pompili, 2020).

In March 2020, all educational activities had to be moved online due to the emergence of Covid-19. It seems still too early for an in-depth and all-round analysis. However, as I intend to show later in this work, such new actor in the field of Italian higher education is bringing important changes in the governance of digital knowledge (§ 6.4) and in the engagement with the digital by organisational and individual actors (§ 7).

⋆ ⋆ ⋆

In this chapter, four stories have been told: about the inter-university consortium CINECA, observed as a hybrid public/private, State/market actor; about the expansion of *università telematiche*; about the MOOCs in Italy, between standardisation through public policies and marketisation triggered by private global actors; about the emergence of distance teaching in Italian higher edu-

cation.

In these stories, a wide array of actors can be identified across multiple scales: policy actors, edu-businesses, standardisation agents, higher education institutions, etc. These heterogeneous players seemingly enact wider trends tensions towards the marketisation of higher education and new public management. They embed and reproduce values and beliefs as a sociomaterial substratum which act on the everyday practices of users and institutions.

Higher education platforms thus appear as opaque cores that entangle with higher education governance, policies, and practices through sociocultural processes. Thereby become visible the mutual transformations between society and technology as they are mediated by digital platforms in higher education. In the next chapter, I shall further pursue my zooming in on the empirical field (Nicolini, 2017) by exploring and disassembling such forms of mediation as to the case of the 'Sapienza' University of Rome.

part III

practices

DISASSEMBLING PLATFORMS

TEACHING, RESEARCH AND ADMINISTRATION PLATFORMS IN 'SAPIENZA' AS TECHNOCULTURAL AND SOCIOECONOMIC PROCESSES

5

In the previous Part of this work, I adopted a macro outlook to observe broad processes involving heterogeneous social actors and scales. In particular, I outlined some forms of digital platforms that have emerged on the global level and some traits of the process of platformisation of higher education in Italy. The third Part of this research is devoted to the observation of these processes as they occur in the empirical field. Specifically, I shall observe the digital platforms of Sapienza (§ 5), the 'translation' of informatisation in practice in Sapienza (§ 6), and online teaching practices during the Covid-19 emergency in the Italian higher education (§ 7).

The boundary between digital platforms in higher education is indeed blurred and unstable, as they are interconnected and entwined at the historical and technical level. As the first step in my enquiry, I attempt at unpacking this tangle. In this chapter, in particular, I detect and disentangle the main online platforms used for teaching, research and administrative work in the digital ecology of the university 'Sapienza'. I thereby observe the processes through which these digital actors have connected with such ecology, as well as the everyday practices of their users and the underlying organisational logics.

At the methodological level, I proceed with charting and unpacking the platforms as data assemblages (Kitchin & Lauriault, 2014), i.e. "amalgams of systems of thought, forms of knowledge, finance, political economies, governmentalities and legalities, materialities and infrastructures, practices, organisations and institutions, subjectivities and communities, places, and marketplaces"

(Kitchin & Lauriault, 2014, p. 24). I shall deploy José Van Dijck's (2013) 'connective' strategy aimed at "*disassembling microsystems* (…) [b]y taking apart single platforms into their constitutive components" (ivi, p. 25, italics in the original text; see also Williamson, 2017). Platforms are thereby unravelled as both technocultural constructs (made of materialities and inscriptions as well as practices performed by their users) and organised socioeconomic processes (made of governance logics and business models).

I focus on seven online platforms used in Sapienza that I deem empirically relevant[1]. In particular, I consider CINECA's CRIS IRIS (§ 5.1), CINECA's ERP U-GOV (§ 5.2), Be Smart's ERP GOMP (§ 5.3), InfoSapienza's online secretariat InfoStud (§ 5.4), Moodle LMS (§ 5.5), and Google's G Suite for Education (§ 5.6). I conduct a historical reconstruction of the emergence of such platforms in Sapienza and disassemble them by retracing the socioeconomic patterns, materialities, and practices on which they rest.

5.1 MANAGING, SHOWCASING, EVALUATING RESEARCH: The IRIS CRIS by CINECA

IRIS (Institutional Research Information System) is the Current Research Information System (CRIS; § 3.1) developed by CINECA. CINECA defines IRIS as "a set of modules that informatise all the processes related to Research" (2020; translation by the author). IRIS is intended to manage a research catalogue (Institutional Repository), research resources (Resource Management), activities and projects (Activities and Projects), scientific evaluation (Evaluation and Review), and competences (Unifind portal).

1 I have chosen to exclude from the analysis some platforms that I consider less pervasive in the ecosystem of Sapienza University. Some of them have a minor impact on the everyday life of the Sapienza professionals (Athena, Corsidilaurea, the Microsoft Student Advantage package, OPIS, PhD Platform, SIGEBA, etc.), while others are no longer actively maintained (AuleGest, Percorsi Formativi, etc.).

As mentioned (§ 4.1), until 2013 the CINECA U-GOV suite worked both as an ERP and – to a residual extent – as a CRIS. In 2007, CINECA started the development of IRIS in order to unbundle the CRIS functionality from U-GOV; also, in its development converged functionalities and technical expertise from the SURPlus CRIS by the CILEA consortium (Galimberti, 2014; Colarusso, 2017). Starting from 2013, all the universities using the U-GOV CRIS functionality had to migrate to IRIS; organisational issues and problems concerning input cleaning and output control were reported during the transition (Colarusso & Giancola, 2020).

As to Sapienza, the migration from the U-GOV CRIS to IRIS started on 4 May 2015. The process was supported by the CINECA Director, the Sapienza governance, the Research Referents in nine Sapienza Departments, the U-GOV Project Manager GOV and a technical-scientific committee for research projects (Sapienza, 2020b). As of 18/04/2018, IRIS was used in 70 Italian higher education institutions, including 62 of the 91 Italian universities (U-GOV Wiki, 2020a).

5.1.1 The IRIS CRIS by CINECA: Organisation, governance and the market

The IRIS CRIS entered Sapienza through the CINECA network, which is external and superordinate to the local university scale. Such network unfolds as a consortium within Italian higher education wherein CINECA plays a coordinating role; however, as we shall see (§ 5.1.2; § 9.1), it is also connected to competitive spaces in the global higher education sphere. IRIS is licensed to the member universities as Software-as-a-Service (SaaS), i.e. it is installed in CINECA's servers and accessed by Sapienza through cloud-based apps on the internet.

5.1.2 The IRIS CRIS by CINECA: Materialities

IRIS acts through diverse material components: standards; modules; data; a customisable user interface that is diversified between

a 'public space' and a 'private space'.

IRIS' most important *standards* concerns how it arranges and produces data; for example, the CERIF format – which CINECA reconfigured for the local demands of the Italian higher education (§ 9.1) – allows internal and external interoperability (§ 8). IRIS *data* and software is physically stored on Oracle databases on CINECA servers that almost all Italian universities have to query every day for their digital routines. IRIS' functions are distributed across various *modules*: Institutional Repository/Open Archive, Evaluation & Review, Resource Management, Expertise & Skills, Activities & Projects, etc. As to the *user interface*, IRIS' look&feel is only partially prescribed by CINECA, as individual universities can tweak it through an adaptive theme and carry out modifications on CSS codes and images. It is thus possible to customise it and make it consistent with the university's appearance (U-GOV Wiki, 2020b).

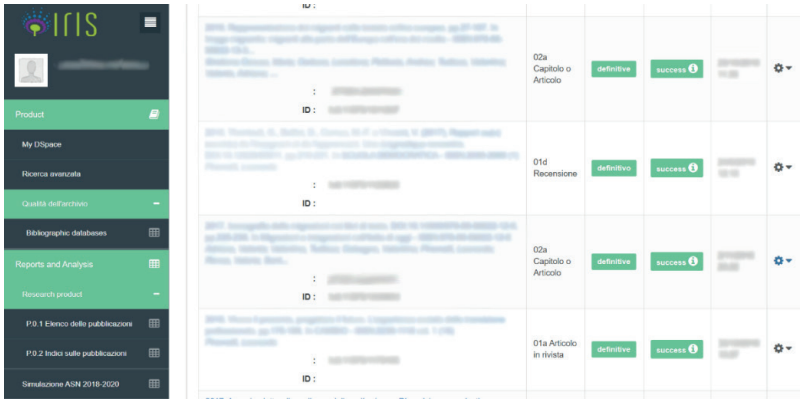

Figure 16. The frontend interface of IRIS IR's 'private area' (source: screenshot by the author; last access: November 2020)

In Sapienza, the area of IRIS devoted to the institutional catalogue (IRIS IR) consists of at least two 'spaces': a 'public' and a 'private' space. The 'private area' (Fig. 16) – a sort of 'backstage' – is only accessible to logged-in users: researchers, managers, operators, administrative staff, etc.

Once logged in, researchers can handle a management panel for their research output. They can manage the research products they uploaded on the IRIS institutional catalogue, create links between global bibliometric databases and products, access to analytics and search functions; also, this area allows to upload research products. Uploading research products is requested for accountability purposes as well as to receive formal validation of one's scientific production from ANVUR and participate in calls issued by MIUR. Italian academics can upload their publications only through CINECA platforms, i.e. IRIS (for the universities adopting it) and LoginMIUR[2]. The CINECA platforms thus become an obligatory point of passage to make a career as an academic in Italy. Evaluation, which is a state issue, is delegated to CINECA platforms, thereby becoming an everyday academic practice.

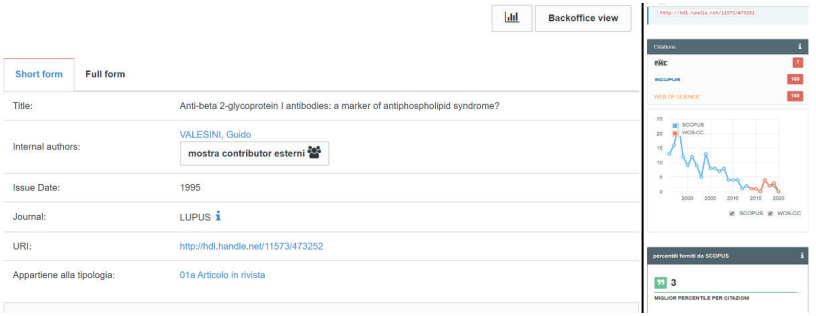

Figure 17. The frontend interface of IRIS IR's 'public area' (source: screenshot by the author; last access: November 2020)

IRIS IR also includes a 'public space' that all users – non-registered visitors as well as registered users – can access. In this space, research work is arranged and displayed as research output (Fig. 17). Research metadata is displayed on the left side of the webpage. On the right side, the performance of research products is measured on global bibliometric databases such as PubMed Central,

2 LoginMIUR is the MIUR platform developed by CINECA. It allows academics to participate in MIUR initiatives as well as updating their CV and uploading their research products (Grimaldi, Lumino, & Gambardella, 2020).

Scopus, Web of Science. A snapshot of the citation count for that product is followed by a visualisation of its performance over time through line graphs. Discursive and visual links are built that connect the research products of Italian universities with transnational infrastructures that produce standards and bibliometric rankings. These bibliometrics are supposed to support human resources and general governance in decision-making (Bollini, Mennielli, Mornati, & Palmer, 2016, p. 740).

5.1.3 The IRIS CRIS by CINECA: Using IRIS in practice

IRIS IR offers three main affordances (Gibson, 1979). The most used regards *accountability*. As shown, through IRIS, researchers inform the MIUR about their scientific production. They can thus participate in calls, career advancements, and any competition encompassing a quantitative title-based selection. A second affordance pertains to *monitoring and evaluation* of research activities. This function is available for the governance of universities and departments; through IRIS IR, these administrative actors can extract data and visualise the productivity of departments and researchers. A third affordance regards *research*. The 'public space' of IRIS IR allows researchers to enter strings to be searched in the publications database.

All the professors I interviewed use IRIS. However, its use is practised with different strategies. On the one hand, some consultants align to the platform just 'because they have to' – and reluctantly. In their vision, IRIS is more or less explicitly imposed by the bureaucratic institutional programme (Dubet, 2002). Rather than a tool for practices and professional development, IRIS is experienced as a constraint that is connected to accountability:

> I always end up doing all the stuff at the very last minute (…) It's something I always do in my spare time, usually at night – and usually with great fatigue. I have little enthusiasm for this platform. It is like when I have to go to the post office to pay a bill. (Professor, Faculty of Medicine and Psychology)

> I must say that, like all the Sapienza platforms, it is not very user-friendly. This is a big limitation. They are complex to use; I mean, it takes a very long time. Every time, you have to waste a lot of time. I hate using them. I use them because I am forced to. (Professor, Faculty of Communication Science)

On the other hand, some professors use IRIS because they want to. For example, they use features in IRIS that support their academic practice. These are, for example, interoperability functions (§ 8) that streamline administrative procedures, or IRIS' storage capacities:

> When I publish something, I know it is better to put it there [on IRIS]. (…) there are a series of automatisms (…) Sapienza can automatically show everything you have on IRIS. Since after obtaining the National Scientific Qualification, I have had the feeling that by updating my publication record on IRIS I would have benefited from all these procedures, especially those within Sapienza. (…) sometimes I take some small publications from there, using it as if it were a cloud storage, rather than searching for them on my computer, because I can't remember what the final file was. (Professor, Faculty of Social Science and Economics, D)

Hence, IRIS IR by CINECA appears as a complex object that exerts non-neutral effects on the everyday academic practices and careers. On the one hand, it incorporates new public management logics in its workings and affordances, emerging thereby as a tool for insufflating entrepreneurial spirit in the academic subjectivities (Normand, 2016) through accountability procedures, quality technologies, and commensurative measurement (Espeland & Sauder, 2016). On the other hand, it enables the open consultation of a vast catalogue of research products that is co-created from-below by the researchers themselves. Furthermore, IRIS IR lies in a hybrid position between the "modern infrastructure ideal" bearing the promise of services for all, and the business-oriented focus of online platforms (Plantin, Lagoze, Edwards, & Sandvig, 2018). Some of the CINECA's properties are indeed typically

infrastructural (Fig. 18): for instance, the interoperability it provides as well as the 'opt out' kind of agency that users can exert.

	Infrastructure	Platform
Architecture	Heterogeneous systems and networks connected via sociotechnical gateways	Programmable, stable core system; modular, variable complementary components
Relation between components	Interoperability through standards	Programmability within affordances, APIs
Market structure	Administratively regulated in public interest; sometimes private or public monopoly	Private, competitive, sometimes regulated via antitrust and intellectual property
Focal interest	Public value; essential services	Private profit, user benefits
Standardization	Negotiated or de facto	Unilaterally imposed by platforms
Temporality	Long-term sustainability, reliability	Frequent updating for competitive environment
Scale	Large to very large; ubiquitous, widely accessible	Small to very large; may grow to become ubiquitous
Funding	Government, subscription, lifeline services for indigent customers, pay-per-use (e.g. tickets)	Platform purchase (device), subscription (online), pay-per-use (e.g. TV shows), advertising
Agency of users	"Opt out," for example, going off the grid	"Opt in," for example, choosing one platform instead of another; creating mashups

API: application programming interface.

Figure 18. Infrastructures and platforms properties (source: Plantin et al., 2018: 2099)

Other properties are characteristic of digital platforms, such as its modular architecture and the extensible scale. Finally, some of its attributes place IRIS on the boundary between infrastructures and platforms. This is the case of CINECA's hybrid market structure and focal interest: on the one hand, CINECA is formally regulated as a sort of private monopoly functioning for the public interest; on the other, it has had legal issues for having sold for-profit services to private individuals external to the consortium (§ 4.1).

5.2 GOVERNING BUSINESS PROCESSES IN HIGHER EDUCATION: The U-GOV ERP by CINECA

U-GOV is an Enterprise Resource Planning system (ERP; § 3.2) oriented to business processes and developed by CINECA. CINECA presents U-GOV as an "integrated information system for the governance of universities, aimed at defining objectives, strategies and means to achieve results and to monitor them (U-GOV Wiki, 2020a). Its objective is to govern and manage accounting, teaching, human resources, projects, careers, and students.

The U-GOV project was launched by CINECA in 2005 to develop a new information system that would integrate all the software solutions that the consortium provided (CIA, CSA, ESSE3, etc.) into a systematic ERP vision that would "manage complexity in a systemic vision through a configurable information system that is always up-to-date with technological developments" (CINECA, 2007). Since 2006, modules have been completed and released in beta version. U-GOV (Fig. 19) is still maintained today (November 2020) with continuous updates; the current release is 20.05.03.00.

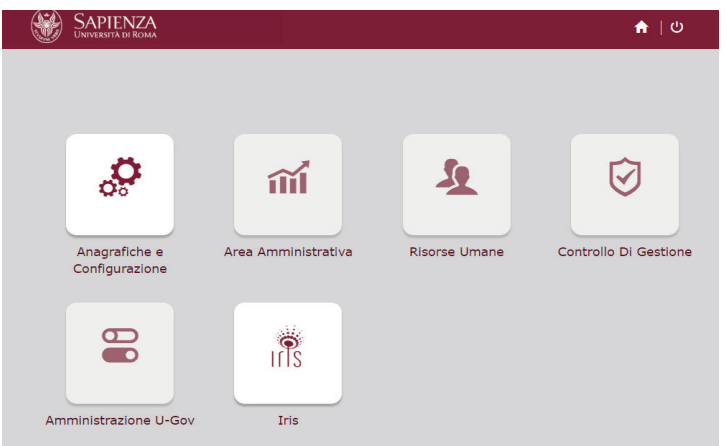

Figure 19. The frontend interface of U-GOV (source: screenshot by the author; last access: November 2020)

Hence, as in the case of IRIS, U-GOV reached Sapienza after a commercial negotiation. In particular, Sapienza acquired U-GOV following resolution 89/2011 on the *Act regulating the Relationships between the University 'Sapienza' and CINECA* (Sapienza, 2011). This resolution came two years after Sapienza joined the CINECA Consortium (§ 6.2.2.). Today, U-GOV is licensed according to a Software-as-a-Service model.

U-GOV is based on a service-oriented architecture (SOA) with a focus on integration, flexibility, and path dependency. It is composed of an intermediate layer of web services that transparently mediates access to data and software functions while hiding the complexity of the system itself (CINECA, 2007). As in the case of IRIS, U-GOV templates are customisable by individual universities.

The U-GOV manual describes six functional areas and modules:

- 'planning and control' supports and enhances the planning and control processes in the universities;
- 'accounting' lays the foundations for a concrete improvement in the informatised management of the universities' accounting system;
- 'teaching and students' is dedicated to curriculum planning, which is a central activity that expresses the strategic objectives of each university;
- 'human resources' allows the complete management of the university's staff;
- 'research' allows the management and monitoring of all activities related to research at University level (unbundled and merged into CINECA IRIS CRIS from 2013; § 5.1);
- 'project management' allows the management of all types of projects.

In general, this platform is used by the administrative secretariats that operate it for governing the university's processes and activities related to the abovementioned modules. Professors can

normally access only the 'Master Data and Configuration' and 'Human Resources' areas to download their payslips.

On access, the Uniroma1 U-GOV platform has buttons for six areas: 'Physical Data and Configuration'; 'Administrative Area'; 'Human Resources'; 'Management Control'; 'U-GOV Administration'; and a link to IRIS.

5.3 MANAGING THE EDUCATIONAL OFFER: The GOMP ERP by Be Smart

GOMP (*Gestione Ordinamenti, Manifesti e Programmazione didattica*; Management of Teaching regulations, Teaching curricula outlines and Teaching offer) is a module within Smart Edu – which is an Enterprise Resource Planning system (ERP; § 3.2) for higher education – developed and provided by the Italian company Be Smart. GOMP aims at managing the educational offer in universities in all its aspects: "from the definition of a degree programme and its contents, to its delivery through control and simulation phases" (Be Smart, 2020, translation by the author). GOMP includes interoperability tools: "automatic data export tools (already validated) for the provision of the AVA 'professors' and 'teaching' tracks provided by ANVUR, or through applicative collaboration (web service) with the AVA/MIUR/ANVUR systems" (ivi).

Sapienza uses GOMP for managing the curricula of degree programmes, graduate schools, doctorates, etc., as well as for supporting ANVUR accreditation activities. Moreover, it provides students with supplementary services for managing curricula and booking exam dates. Be Smart also provides additional services to Sapienza for the display of supplementary diplomas, the publication of its teaching offer, international mobility, student questionnaires, and more.

GOMP entered the history of Sapienza's informatisation (§ 6) following the publication of Ministerial Decree 270/2004 which imposed transparency and publicity to Italian universities with re-

gard to the outline of their teaching curriculum. From then on, Italian universities have to publish an yearly list of their degree courses with all additional information (*Manifesto degli studi*). At the time the decree was published, this practice was not institutionalised in Sapienza. The university thus had to find a way to respond quickly to the new policy requirements. Sapienza's two Faculties of Architecture had already been testing, for some time, a piece of software by Be Smart which was initially to be used only for internal requirements. However, given the success of this local experience between 2004 and 2005, the governance of Sapienza decided to extend this system and evolve it to cover the needs of the entire university.

A working group was set up in 2005 to customise the basic GOMP software to Sapienza's needs and integrate the product with other software used at the university. As told by one of the protagonists of this story at Be Smart, in the beginning there was "a very strong communion of intent and a desire to do things together (…) A very constructive period in which functionality was renewed and extended" (Be Smart IT Specialist):

> a working group [was set up] that, for four years, met basically every week for half a day with Be Smart to identify what had to be implemented and to verify that it worked correctly. GOMP (…) was 'organised' in such a way that it could work in (…) 'cooperative application', i.e. it could exchange information with InfoStud. (InfoSapienza IT Specialist D)

With Frati's Rectorate and the management-oriented phase of IT governance at Sapienza (§ 6.2.2), tensions emerged between Be Smart and Sapienza. The Sapienza governance moved towards CINECA's software and issues arose regarding copyright and the ownership of the GOMP's source code. However, at its foundation in 2008, InfoSapienza approved the use of GOMP, which thereby remained as an ineliminable actor in Sapienza. As will be shown shortly (§ 6.3), the Sapienza governance decided in 2017

to switch entirely to CINECA products. This choice marked the realignment of Sapienza's governance – or at least a part of it – towards integrated rather than local and artisanal solutions. At present, however, GOMP is still solidly used in Sapienza.

5.3.1 The GOMP ERP by CINECA: Organisation, governance, and the market

GOMP made its way into Sapienza through an external network that brings together the national market of software suppliers for higher education. At the time of writing (November 2020), 21 employees plus a CEO work at Be Smart. Through the aforementioned customisation phase, Sapienza's GOMP installation has achieved a high degree of local adaptation (§ 7). A player in Sapienza's governance discusses its alleged integration problems and its strong customisability:

> It is easy to maintain and modify it. "Shall I go and buy the dress from the shop or shall I have it made by the tailor?". (…) The tailor doesn't give me any guarantee that s/he can offer me a larger production. So, if s/he has finished the fabric, for example, and s/he has to sew a jacket and a pair of trousers for me, maybe I'll run out of trousers. But s/he has the advantage that, if the jacket is a bit large, s/he can tighten it. (Governance actor C)

GOMP is intimately interconnected both to Sapienza's practices of community, and to wider inter-organisational governance dynamics. Far from being a mere technical tool for entering data into databases, GOMP acts as a connector between the teaching sphere and the governance field: it links and interweaves multiple actors (institutional reforms, degree programmes, quality guidelines, ministerial databases) on apparently distant scales (institutional, national, transnational). In the Italian higher education system, the accreditation of new degree programmes requires a positive opinion from the National University Council (CUN)

and a quality assessment by ANVUR. In addition, degree programmes must comply with regulatory constraints that are specific for each degree class – and constantly moving to adapt to political and cultural transformations. In addition, the curricula of degree programmes must be articulated according to the Dublin Descriptors, which were developed as a quality assurance tool within the EU (Luzzatto, 2011). Finally, for an accredited degree programme to be activated, the proposing university must input it into the Italian Educational Offer Database (SUA-CdS). In Sapienza, this complex work of interconnection is carried out through GOMP, to which the introduction of new degree programmes is delegated.

5.3.2 The GOMP ERP by CINECA: Materialities

Materially, GOMP is a web-based module within Smart Edu (Fig. 20). Data is stored in servers within InfoSapienza data centres: "For security reasons and a variety of other factors, we have ensured that this supplier's machines are physically installed in-house. So, there is no data transmission in the cloud anywhere; they remain within our buildings". (InfoSapienza IT Specialist B).

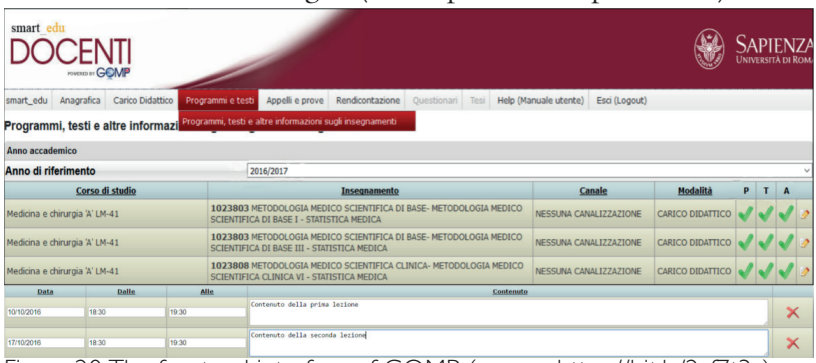

Figure 20. The frontend interface of GOMP (source: https://bit.ly/2zf7t3y)

As to the graphic interface, it is built through Microsoft's .NET Framework. Such software assists in the construction of APIs for interoperability. This brings at least two advantages:

> [F]irst of all, it allows to follow the AGID guidelines, the Digital University Guidelines, the Digital Administration Code (…), and everything else that require everyone to develop interoperable products. Then, technically, instead of writing tons of code for the interfaces, these modern visual study tools allow to automatically create interfaces. (Be Smart IT Specialist)

Therefore, this technological choice allows to work "on the schemes, not on the structures (…); for us, adding data means updating a scheme; the whole application is interoperable, up to the presentation level" (Be Smart IT Specialist).

5.3.3 The GOMP ERP by CINECA: Using GOMP in practice

Three main uses of GOMP have emerged from the empirical field. As shown, the main affordance concerns *accountability*. Through GOMP, Sapienza professors have to account on their teaching activities, prepare reports, describe any extra activities. A second use is *administrative*. GOMP is used to activate some of Sapienza's administrative procedures such as the distribution of resources or opportunities (e.g., salary increases). Finally, GOMP is used as a *data source* for curricula, teaching, etc. Within GOMP, professors input data about teaching that are subsequently exhibited via API in the interoperating Corsidilaurea catalogue (§ 9.2.1).

The professors' opinion on the platform is almost unanimous. GOMP is most often judged with resentment and hostility. It is considered as the expression of a bureaucratic institution, mistrustingly forcing workers to account for their work:

> I never use it voluntarily. Simply, an e-mail arrives saying that for the next academic year I have to enter the programs and update my curriculum. So, I do that – but I swear while I doing that (…); and I only comply because it is an obligation (Professor, Faculty of Social Science and Economics, D).

> It is a nightmare – the bureaucratisation. These platforms are very old. They were born in distant years now, updated very slowly and not properly maintained. My judgment is very poor. (Professor, Faculty of Civil and Industrial Engineering)

According to some consultants, GOMP is a real actor structuring processes, rather than a tool aimed at supporting practices:

> I have a somewhat conflictual relationship with GOMP. I live it as an artefact that structures most of the educational processes (…) When you want to work on the reform of the legal systems you have to keep in mind those tables [of the MIUR]. Then, there is a whole structuring of the artefact that constrains what you can do and what you cannot do (…) it seems to me a bit like the *dominus* that governs the architecture of the educational offer and limits possibilities for innovation (Professor, Faculty of Social Science and Economics, C).

> Since it is rigid and structured in a certain way, at a certain point you tend to align rules to the IT platform and not vice versa. What the IT platform does not allow you to do – because it has not been developed appropriately, or its development has stopped at a certain point –that becomes the rule, because it is not possible to do otherwise (Professor, Faculty of Civil and Industrial Engineering).

GOMP is sometimes considered a labyrinthine platform, scarcely interoperable and not very user-friendly:

> It is mangy (…) it makes you waste a day when it comes to annual reporting (…) pieces of information do not dialogue with each other (Professor, Faculty of Communication Science)

The criticism in these excerpts is perhaps addressed not only at GOMP's user experience, but also at the values and purposes it inscribes. In this sense, the rejection of GOMP might imply a refusal of new public management in higher education, of which it is seen as an instrumentation and as a materialisation. In Sapienza, relentless accountability and reporting is indeed the realm

of GOMP, which acts as an irreplaceable connective core linking actors, institutions, practices and processes on different scales. Observations conducted on the artefact in use as an anchoring for technical-professional practices in the communities of professors and administrators working at Sapienza could shed light on further aspects of its stabilisation and visibility beyond discursive regimes.

5.4 AN ONLINE STUDENT SECRETARIAT: The InfoStud student career management platform by InfoSapienza

InfoStud is the platform for the management of student careers developed and used at Sapienza. It allows students to perform their university enrolment, print bulletins and certificates, book exams, and more. InfoStud was developed since 2000 to digitalise the material processes of the student secretariat. Many consultants from Sapienza's governance consider InfoStud as the beginning of the processes of informatisation at Sapienza.

The technologies to informatise student secretarial processes at Sapienza have a rather long history. The first digital technology to appear was probably an 'electronic booklet', in 1988. It was "a sort of credit card with a microprocessor recording the user's entire administrative and teaching career" (Diluvio, 1988, p. 66, translation by the author). This 'portable terminal' for professors weighed around seven kilograms:

> It was a hellish system (…) 60–70cm long, 40cm wide. In short: big – really big. And this object had a small printer through which you could print the result of the exam on the spot and hand it over to the student. Then you could bring it to your office, connect the modem to the central systems and transfer these transcripts. (InfoSapienza IT Specialist C)

> It was a contract to I-no-longer-know-who (…), without specifications. And they did atrocious things. In the beginning, the professor had to transmit the grades with a modem. In

practice, it was a total failure. (InfoSapienza IT Specialist D)

At the beginning of the 2000s, the need for a proper piece of software to manage the students' careers arose in Sapienza. CINECA proposed its ESSE3 application, but Sapienza preferred to launch a public tender for a software to be developed *ad hoc*. The call for applications was won in 2003 by Auselda, one of the main Italian software houses. InfoStud was a more agile idea than the previous technology, as it could be used by any computer connected to its dedicated servers. After Auselda's bankrupt in 2013, it was decided that InfoSapienza would have taken over InfoStud's source code and the project as a whole. In recent times, InfoStud has been re-engineered according to an interoperability-based model resting on micro-services (§ 9.3.2). In addition, new modules have been introduced for managing online theses, as well as a new frontend interface for secretariats and professors.

5.4.1 InfoStud by InfoSapienza: Organisation, governance and the market

InfoSapienza is the organisational *locus* of local and artisan knowledge in Sapienza. Just as GOMP, InfoStud is a tailor-made and customised product that was almost entirely crafted within Sapienza. Today, InfoStud belongs to Sapienza in terms of intellectual property and source code. As shall be shown (§ 6), InfoSapienza's organisational texture is now stretched between diverse tensions as external market players enter the same field of practices.

5.4.2 InfoStud by InfoSapienza: Materialities

InfoStud currently consists of three main modules. The Phoenix module, re-engineered after its 'homecoming' from Auselda, is the nucleus of InfoStud. It digitalises secretarial tools for students (e.g., exam dates bookings, bulletins and certificates, etc.). The Ragno module (from Ragno Blu, i.e. Blue Spider, the building that has been the headquarters of part of InfoSapienza since 2017) is the

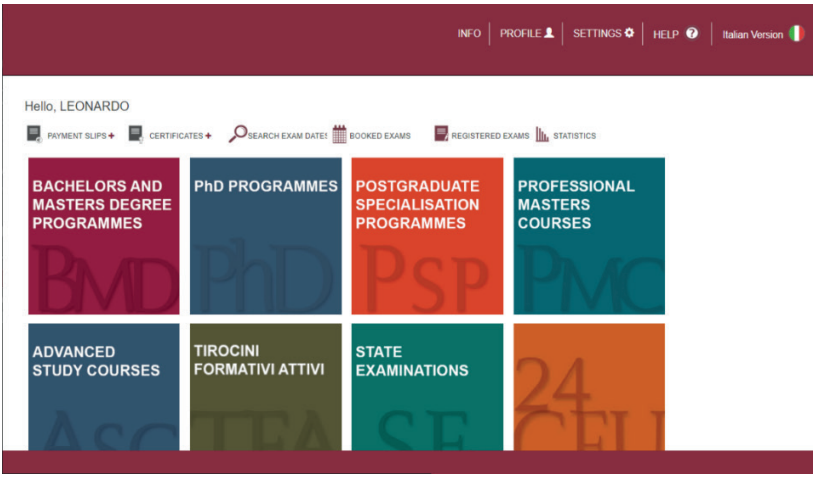

Figure 21. The frontend interface of InfoStud (source: screenshot by the author; last access: November 2020)

frontend for the secretariats. The Flamingo module is the frontend for the professors. Degree Thesis, recently released, informatises the dissertation procedures.

Materially speaking, InfoStud is built as a collection of micro-services API which allow InfoStud to interoperate with infrastructures and platforms internal and external to Sapienza (§ 9.3.2). For security reasons, InfoStud data are stored both at Ragno Blu and under the Physics building in the Città Universitaria complex (Fig. 21).

5.4.3 InfoStud by InfoSapienza: Using InfoStud in practice

Different users are inscribed in InfoStud's functioning: students, professors, administrators. The main affordance for professors pertains to the management of the students' exams (management of exam appeals, surveys on teaching, etc.), while administrators mostly use it to manage the students' careers (transfers, passages, verification of requirements, etc.).

As in the case of GOMP, the opinion of the consulted users– professors and governance actors – is rather negative. The first

recurring considerations concern InfoStud's obsoleteness. This aspect is underlined both by those with IT experience and lay users:

> Infostud is a very old piece of software now. Very old. (…) We could compare it to a car from the 1970s. It still runs. You can maintain it with care, you can change its tyres – but the concept is obsolete. (…) InfoStud was developed at a time when people didn't even know what a 'safety requirement' was. Yes, then they modified it, they improved it – but this is different from a system that has cybersecurity features built in by design. (Governance actor, C)

> It is a very old platform, from an IT point of view. I can't remember how old it is, but they tell me it's too old for an IT product. That's because it's hard to connect it to all the new IT platforms (…) Developing any new function is a very delicate matter because of the age of the product (…) We only ask for things that are truly indispensable and have little impact (…) The InfoStud system is suffering from old age. (Governance actor, A)

> InfoStud is a bit of a mausoleum. For many years we have been talking about upgrades and overhauls. It works by some miracle. (Professor, Faculty of Civil and Industrial Engineering)

> I consider InfoStud primitive. It simply has the function of recording exams. It has no other function. (Professor, Faculty of Social Science and Economics, D)

InfoStud is criticised for its poor efficiency and user-friendliness:

> It is an inefficient tool. Not to mention the fact that it doesn't stack up: sometimes it doesn't talk well with Chrome, sometimes with Internet Explore. It causes a lot of problems. (Professor, Faculty of Communication Science)

> There are a thousand things that I do not like (…) with respect to its effectiveness. For example, if you are inactive for more than five minutes, you have to log out and then log back in. (Professor, Faculty of Social Science and Economics, D)

Like GOMP, InfoStud is narrated by some consultants as able to escape the control of its creators and users. Hence, they experience not only resentment but also fear (Pellegrino, 2019) towards InfoStud. It appears endowed with agency, as its users are made 'slaves' under its influence:

> Sometimes, we find ourselves having to adapt to the potentialities of a [digital] tool rather than to our own needs. (…) why, if I try to experiment with solutions that solve certain problems affecting the evaluation of the degree programme, can't I do that? Just because the tool doesn't allow it? It's pure madness. I cannot be a slave to a technological instrument, the technological instrument must help me. (Professor, Faculty of Communication Science)

Some consultants, though, highlight the innovations incorporated in InfoStud in recent years. Through gradual innovations and adjustments – digital theses, digital signatures, new methods for booking exams – InfoStud is seemingly achieving a new fluidity and becoming 'new'. The capacity of InfoStud to change and adapt in the face of the sudden pandemic emergency has also been underlined (§ 7):

> For example, I have been managing digital theses since 2018 [through InfoStud]. Through it, I can know who I have graduated, how many students I have graduated, what year… It's effective, very effective. Then, another very important thing is the digital signature. Somehow, through InfoStud, all the intermediation that there was before has disappeared. (Professor, Faculty of Social Science and Economics, E)

> During the lockdown period, InfoStud has been particularly useful and important, because it has the functionality to send emails to selected groups of students on their institutional email (Professor, Faculty of Social Science and Economics, C).

> The strong side of InfoStud in my opinion? That it is an internal product, so if you need to make a change you can do it. (…) Something that becomes urgent and absolutely unpre-

dictable can be managed, if there is a product that can be easily handled from the inside. (Governance actor, D)

5.5 TEACHING AND LEARNING ONLINE: The Moodle LMS by Moodle HQ/MediaTouch

Moodle (Modular Object-Oriented Dynamic Learning Environment) is one of the most used Learning Management Systems (LMS; § 3.3) in the world (Moodle, 2020). It is provided as an integrated teaching and learning environment based on a socio-constructionist epistemology. Moodle supports the uploading of documents, communication between professors and students, the publication of information on courses and lessons, the presentation of exercises to students, and evaluation. It is developed and coordinated by the Australian company Moodle HQ with the support of more than 80 partners worldwide. As of March 2020, 69 of the 85 Italian offline/blended universities were using Moodle for managing part or all their teaching offer, sometimes with strong local customisations.

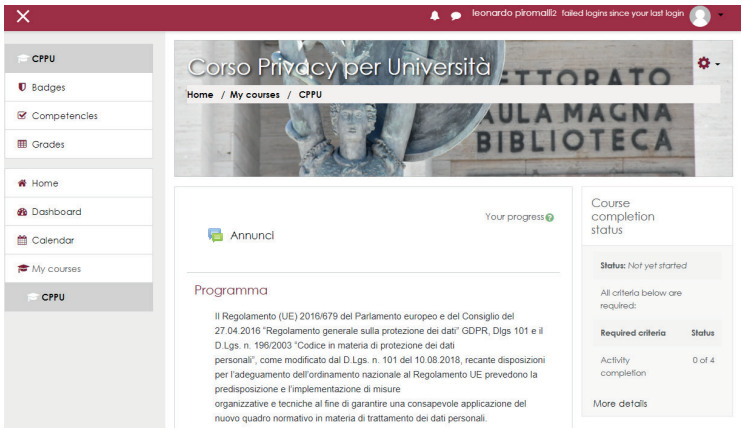

Figure 22. The frontend interface of Moodle (source: screenshot by the author; last access: November 2020)

Moodle (Fig. 22) was installed in Sapienza in 2003 following a 'proto-informatisation' project by CITICoRD (§ 6.1). This was an artisan and experimental phase during which a server was dedicated to the project as well as a fellow from the Faculty of Informatics.

In 2005, the Sapienza Moodle installation served 180 courses created by more than 170 professors from 16 different faculties, with a user base of more than 5.500 students. In 2007, the Sapienza eLearning team collaborated to improve the global Moodle software in order to ensure its compliance with the Italian Accessibility Law 09/01/04 (Stanca Law; Moodle Tracker, 2006, p. 200).

The Moodle eLearning project was absorbed by InfoSapienza with its foundation in 2008. In 2009, the Frati Rectorate chose to outsource the project (§ 6.2.2):

> As the number of users grew, Sapienza realised that it could not keep up with it though its internal resources. So, they outsourced. They resorted to MediaTouch, which is Moodle's Italian terminal. Sapienza's choice for MediaTouch was really effective, since MediaTouch is in close contact with Moodle. (InfoSapienza IT Specialist D)

Today, the main installation of Moodle in Sapienza features a section listing the details of the degree programmes, a section for administration, one dedicated to professional training, as well as a series of courses that faculties sell to external users for a fee. All the departments of Sapienza use Moodle, with a few differences:

> I must say that some departments arrived at Moodle before, while others after. For example, [the Department of] Engineering had its own system, not based on Moodle, which it continued to use for some time and then moved on to Moodle. [The Department of] Law was the last to migrate, perhaps due to its 'all-full-professors' policy, therefore people 'in age'. Architects have used it a lot, physicists, even literary faculties, Languages, Nursing… (InfoSapienza IT Specialist D)

5.5.1 The Moodle LMS: Organisation, governance, and the market

MediaTouch is today in charge of continuously monitoring the installation, backing up the data, and managing security issues, while InfoSapienza plays a steering role. According to a governance actor, Sapienza's agreement with MediaTouch was advantageous for both parties: on the one hand, Sapienza needed external support to manage its Moodle installations; on the other hand, it was convenient for MediaTouch to work as a provider for an important university like Sapienza. The decision to outsource was taken during the Frati Rectorate. In the opinion of a privileged witness, the e-learning project at Sapienza was not promoted with equal consistency by the various rectors:

> Especially at the time of Frati, there was support from the governance. The following rectors showed less support. But at that point, the process had been triggered and went ahead by force of inertia. (InfoSapienza IT Specialist D)

Knowledge about Moodle is rather scattered in the organisational texture. Certain communities of professors are experts of the practice, while the secretariats "probably do not even know it exists" (InfoSapienza IT Specialist D). Recently, investments have been made in Moodle's infrastructure and for training courses. In 'phase 3' of the Covid-19 emergency, it was decided to invest EUR 100.00 in Moodle's licence and server upgrades (Sapienza, 2020a). In addition, training courses were organised in July and September 2019 by the Quality and Innovation of Teaching Working Group (GdL-QuID) which 99 professors attended in total.

5.5.2 The Moodle LMS: Materialities

Materially, Moodle is a piece of software coded in the PHP and MySQL languages. Three installations of Moodle are in use and overlapping in Sapienza: the main one, which at the time of writ-

ing (November 2020) hosts about 196.000 students and 4.000 professors; one used by the Department of Statistical Sciences; one used by the Department of Social and Economic Sciences. The data are stored in a cluster of servers with load distribution managed by MediaTouch.

Moodle's installations in Sapienza are integrated with the university's Lightweight Directory Access Protocol (LDAP) authentication server. This means that users only need to enter their institutional username and password to log in to the platform. Integration with other infrastructures is not currently planned:

> Integrating subjects, degree programmes, etc., would be very complicated and risky. This is because courses are often doubled or tripled, and it is therefore necessary to characterise the course with the professor's name. This is not a reproduction of the GOMP scheme within Moodle: it is something much more articulated. (InfoSapienza IT Specialist D)

5.5.3 The Moodle LMS: Using Moodle in practice

I could observe at least two uses of Moodle in practice among the professors I consulted. Sometimes, they use Moodle as an '*electronic bulletin board*' wherein they publish the outline and details of their courses. This use coincides with a representation of Moodle as an overly complex and poorly user-friendly tool:

> Moodle is not very user-friendly. It is extremely complex. (…) I have participated in the activities of Sapienza university for the definition of the tools for teaching activities [during Covid-19]. (…) a hypothesis was 'Moodle for everyone'. I pointed out that Google Classroom was available, with which I was very comfortable (…) in the end it [Google Classroom] became the alternative tool. The more immediate a platform is and facilitates the work instead of complicating it, the more effective that platform is. (…) The simpler [the platform] is and the easier it makes sharing contents and using it, the more it allows to focus on content rather than on methods and approaches. (Professor, Faculty of Communication Science)

> I know there's a Ferrari, but I just drive around the building. I only use it to publish the programmes on the department page. (Professor, Faculty of Social Science and Economics, C)

> No, I use it very little. I use it at an extremely superficial level. (Professor, Faculty of Civil and Industrial Engineering)

> It's a little complicated to use… I'm honestly not a keen user of Moodle. I rely on what my colleagues tell me. It's complex to use it in a little bit more depth. (Professor, Faculty of Information Engineering, Informatics and Statistics)

Other times, Moodle is used actively and flexibly to build blended and student-oriented teaching practices. In these cases, the professors learn the functionalities of the software for their situated purposes:

> you have very wide possibilities to structure your teaching (…) with Moodle you can proceed in blocks, forcing the student to do unit 'B' only after s/he has done stuff in unit 'A'. (Professor, Faculty of Social Science and Economics, D)

> It thus becomes possible to restructure the forms of teaching towards, for example, flipped learning models (§ 7.4.2):

> my teaching logic is somewhat 'flipped classroom'. First, you study at home what I'm going to explain, so that in class the explanation is not a monologue but focuses on what you have not understood. Anything that is not clear to you or that poses problems, curiosities or questions – you have to bring it into the classroom. (…) There is this aspect of the flipped classroom, i.e. to invert the sequence: first, you study alone with your 'weapons', your skills and your luggage; and then, in the light of that, I will guide you to the lesson. (Professor, Faculty of Social Science and Economics, D)

As mentioned, more than a single Moodle system is installed in Sapienza. While all functions are enabled in the main installation, the access to many of them is precluded in the Moodle platform specific for the Department of Social and Economic Sciences

(DiSSE). As described by a consultant, this is the result of a local process in which moral and political choices came into play:

> It is the result of the Department's interpretation of Moodle. It was decided that Moodle would be used to replace the old 'electronic bulletin boards'. Imagine a bathtub with 27 taps. You can not only open and close these taps, but also adjust their intensity – and here, too, is Moodle's open access philosophy. Basically, the department's IT manager took this bathtub and closed all the taps. Except for one, which is the fact that you can go to the Moodle webpage, log in as a professor, write posts and, at most, upload an URL, a PPT or a PDF. The forum, the chat room, the completion, the evaluations – all closed. When I asked him, he said: "But, you know, what would it look like if a student wrote swear words on the Department website?". DiSSE Moodle has thus become a sort of outline of the teaching curriculum, like the one in the Department's GOMP. (Professor, Faculty of Social Science and Economics, D)

Because of morally-laden decisions taken unbeknownst to them, Moodle users from the Department of Social Science of Economics – professors as well as students – shall thus have to operate a one-to-many and static board rather than an interactive and socio-constructionist LMS.

5.6 CLOUD-BASED COLLABORATIVE TEACHING, LEARNING, PRODUCTIVITY: The G Suite for Education by Google

The G Suite for Education (released in October 2006 as 'Google Apps for Education') is a suite of collaborative cloud applications and services aimed at productivity, teaching and learning that Google offers globally to all educational institutions it considers eligible[3]. Google Suite for Education includes applications

3 In order for an educational institution to qualify for Google Suite for Education, it must have the status of a non-profit educational institution formally

for collaboration (Google Docs, Slides, Sheets, Drive, Jamboard), communication (Google Gmail, Meet, Chat), class management (Google Classroom, Assignments, Forms), organisation (Google Keep, Calendar) and administration (Google Admin). As of 3 March 2020, some features of the Enterprise edition of G Suite and G Suite Enterprise for Education have been extended to all users, at global level, until 30 September 2020. This decision was supported by a narrative about the need to support educational institutions and students during the global challenges of the Covid-19 pandemic (Google, 2020a).

The G Suite for Education entered Sapienza in 2012; it was made available to students first, and then extended to the teaching staff. The infrastructural support was managed by Google's Italian partner Scube New Media/Noovle. A similar agreement had already been made with other Italian universities such as Ferrara, Pavia and Florence.

5.6.1 The G Suite for Education: Organisation, governance, and the market

Several actors collaborated in the incorporation of the G Suite for Education in Sapienza: Google Apps for Education in Europe, Middle East, Africa and Emerging Markets, which provided the products; Scube New Media/Noovle, which supported Sapienza in the process; InfoSapienza, which directed the process and provided expertise on Sapienza infrastructures. Intertwined market actors and public actors thus collaborated in this common informatisation project.

The product was provided free of charge and 'forever' by Google to Sapienza, as well as to several other Italian universities. A governance actor argues that the contract signed by Sapienza is "absolutely secure with regard to data storage, data use, the total absence of advertising, absolute impossibility to provide data to

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accredited and recognised by the State.

third parties. Absolutely secure. This is how it is". (Governance actor C). There was no complete political consensus on the adoption of the G Suite in Sapienza and the stipulation of the contract decision: "just after we decided – I still remember this – there was a colleague, in the Academic Senate, who stood up and said he would sue us because we gave our precious data to the enemy".

This commercial operation is now generally framed as a successful operation, especially for its effects during the 2020 pandemic:

> Right now, the fact that Google is on our side has saved us. Google saved us because it gave us all these services for free, and within a contract; so, we are secure on the privacy side. But nobody ever remembers this. All right – let's take it for granted. (…) It's saving us now. It's saving us. (…) The fact that we have Google has meant that we have never had another interruption of services. Never. It's a thing of the past, practically. Now it's gone. Of course, it's gone! They know how to do it. They know how to do it well. Then you can say: "But they have the data…!", etc., but (…) there's a contract managed by the State (…) and they take the data anyways when you use your smartphone around. (Governance actor C)

An all-round analysis could be able to consider the benefits of Google's educational platforms during the pandemic, and take into account the potential technological and/or organisational lock-in of educational institutions to this big player in the platform market (Giancola & Piromalli, 2020).

5.6.2 The G Suite for Education: Materialities

Materially, G Suite for Education is a collection of cloud applications by Google. These applications can be accessed online by authenticated users. User-generated data (e.g., Google Doc files) is also stored by Google on its own servers and kept on users' Drive archives as well.

A different architecture is applied to the Gmail e-mail service. In this case, the access passwords are stored by Sapienza on its servers. Google cannot have access to them:

> We have the passwords in-house. This is the trick: when you open your browser and go to Gmail.com, and ask for access with your user@uniroma1.it, Google redirects you to a page, the famous red one where you enter your Google credentials. At that point, when you enter your password and click 'send', all Google's federated systems come in nanoseconds to knock on our authentication machines. They pass us an encrypted username and password, and ask us: "Is that her? Will you give me back the token for this user?", and they keep the encryption on the password systems. So, Google in its cloud does not have our passwords: they are in our house. This is made very clear in the agreements we made when Google won the mail services competition at the time. (InfoSapienza IT Specialist B)

It is therefore a Lightweight Directory Access Protocol (LDAP) authentication system set up by InfoSapienza which allows entering Google credentials to access all the Sapienza IT services.

5.6.3 The G Suite for education: Using Google Classroom in practice

Not all consultants had experience with Google Classroom (Fig. 23). Some professors had taken such platform as the basis for their blended teaching practices even before the lockdown for the 2020 pandemic, while others had their first experiences at that time.

Most of the Google Classroom users that I consulted consider it as a replacement for Moodle. Many of them prefer it to Moodle because of its simplicity and user-friendliness:

> Moodle is not very user-friendly. It is very complex. (…) I started using it two or three years ago, then I discovered Google Classroom and began using it. (…) I felt very comfortable with it, because it was much more dynamic and simpler.

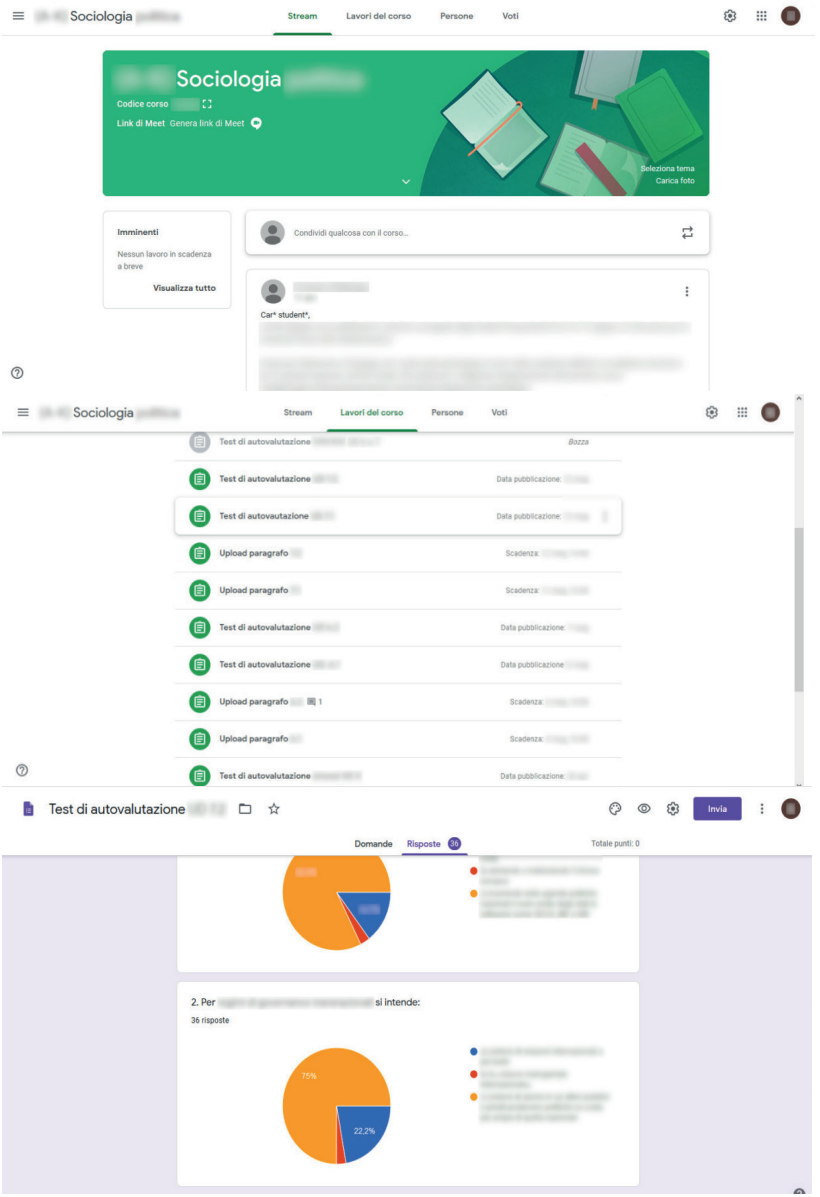

Figure 23. The frontend interface of Google Classroom (source: screenshot by the author; last access: November 2020)

> Therefore, I started using Google Classroom. (…) The more immediate a platform is and the more facilitates your work instead of complicating it, the more effective that platform is. (…) Students use smartphones and tablets a lot: Google's tools are already designed for that. (Professor, Faculty of Communication Science)

> I have used it for classroom teaching. I uploaded the programme on it, I had a discussion forum with the students, I use it a lot with the Google form to carry out formative evaluations during the lessons. That is, I use it as a teaching tool. I find it useful. Of course, like all platforms, it forces us to standardise teaching tools. (Professor, Faculty of Social Science and Economics, C)

However, some consultants consider Classroom to be less customisable and rich than Moodle:

> [T]here are more features in Moodle than in Classroom (Professor, Faculty of Communication Science)

> I had never used Google Classroom because Moodle is a Google Classroom with extra things, so I didn't need it (Professor, Faculty of Social Science and Economics, D).

⋆ ⋆ ⋆

A complex digital configuration unfolds in Sapienza as the effect of the ongoing interweaving of actors from different communities (technical, social, and political), markets and scales. Practices are dematerialised and detached from the usual spaces-times of academia and processes are delegated to artefacts. Teaching, learning, research, management as well as the academic mode of existence (Decuypere & Simons, 2016) itself seem to be reconfigured by these new digital forms.

In particular, four market networks intertwine and compose

the digital archipelago of Sapienza. Some highly customised platforms are developed and re-adjusted within InfoSapienza's internal organisational texture (e.g., InfoStud). Further digital tools for management and teaching reached Sapienza via an external network intra-connecting the national higher education market (e.g., GOMP). Sapienza is also connected to a wider consortium network coordinated by CINECA, which provides management platforms (IRIS and U-GOV) and arranges an alignment arena with national universities and institutions. Finally, actors from the external network of the international market are implicated in this complex tangle: large edu-businesses such as Google, providing education platforms to institutions all over the world.

As shall be described in the next chapter, this is the fragmented and non-fixed effect of historical and stratified processes that, in the focused case, pertain to the translation of information technology in practice.

MAKING OR BUYING ITs

TRANSLATING INFORMATION TECHNOLOGY AT 'SAPIENZA'

6

As shown in the previous chapter, digital academic work in Sapienza takes place across platforms for teaching, learning, administrative work, and research. These online actors form a complex and constantly moving virtual archipelago where differently sized islands disappear and reappear, sink and re-emerge, change their appearance, are left deserted and decaying, and are rebuilt and inhabited again. Such complexity can be studied as the result of a process of ongoing intra-organisational stratification.

This chapter aims at examining the processes of displacement and transformation of the idea of information technology at Sapienza in the last two decades. In this reconstruction, it will be possible to observe heterogeneous encounters between sociological aspects, organisational dimensions, policy regulations, and discursive orientations. I shall make use of two different analytical lenses to select from this thick story the most relevant aspects for my enquiry. On the one hand, the make-or-buy decisions (O. E. Williamson, 1981) taken by the Sapienza governance concerning ITs over the last 20 years are scrutinised, as well as the organisational arrangements they perform. It shall thereby be possible to observe tensions in such inter-organisational field between internal communities and global big players, technical craftsmanship and managerial knowledge, disembedded organisational assets and local actors that are acknowledged yet again in times of emergency (Davis-Blake & Broschak, 2009; Lair, 2019). On the other hand, I shall follow the idea of information technology and ob-

serve its translation[1] in practice (Gherardi & Lippi, 2000) across the Sapienza actor network of Sapienza: how and when such idea emerged? How did it move and transform itself over space and time – and to what effects (Callon, 1984; Czarniawska & Joerges, 2011)?

I shall identify four analytical phases in this story; they correspond to as many different governance configurations and arrangements between local and global actors in the action net I am considering. Methodologically, I adopt a translational policy model (Gherardi & Lippi, 2000) in which ideas or artefacts move by translating the interests of the actors in the network, and possibly co-evolve with them: "[i]nterpretations of the project cannot be separated from the project itself" (Latour, 1996, p. 172). Material and non-material artefacts (policies, organisation, ideas) are thus dealt with not as solid and steady entities, but rather as temporary and erratic assemblages of multiple actors, constantly on the verge of becoming something different (Gorur, 2011b; Williamson, Rensfeldt, Player-Koro, & Selwyn, 2019).

1 In the STS literature, a translation is considered as a "displacement, drift, invention, mediation, the creation of a link that did not exist before and that to some degree modifies two elements or agents" (Latour, 1994, p. 6). When translating the interests of a collective, diverse entities associate with each other, combine their perspectives and simplify their action in increasingly ossified and fixed forms. Temporary identities become durable and apparently irreversible, while one or a few actors become representatives for a multitude of actors by defining and linking together their identities. In the first phase of *problematisation*, the main actor of the translation process becomes indispensable to others by defining their identities and the links that unite them. In order to make entities accept the inter-definitions of their identities, the main actor sets in motion strategies and devices of *interessement* that may be based on seduction, strength and persuasion. If successful, these strategies can lead to the *enrolment* of the entities in an action programme. The definition of identities, interests and objectives is then *mobilised* through representation techniques and the displacement of one or more actors (Callon, 1984). The present chapter draws on Silvia Gherardi's and Andrea Lippi's application of this heuristic tool to the field of public policy (2000).

6.1 2000-2008. MAKING PLATFORMS: Scattered crafters experimenting with proto-informatisation

In the early 2000s, the word 'information technologies[2]' was virtually absent from Sapienza's policies and organisational practices. It did not exist in the programme of the rector Renato Guarini, elected in 2004. Nor could I find it by scrolling through the 'freezes' of the old Sapienza website conserved in The Internet Archive. After further *flâuneries* (§ 2.3), I found it in the CITI-CoRD[3] and SATIS[4] webpages. A sort of proto-informatisation was emerging at the time in the artisanal 'making' embodied by the professional practice of Sapienza's IT Specialists.

CITICoRD was founded in 2001[5]. It managed Sapienza's network services, some web services, library services, and an important part of the e-learning services for students. Fifteen academics were employed in the CITICoRD, which functioned as a service centre. By contrast, Division VIII SATIS – which was founded in

2 I shall use the expression 'information technology' to translate the Italian lemma *informatica*, often recurring in the words of the consultants. According to the Italian dictionary Tullio De Mauro, *informatica* denotes a discipline that "deals with the collection and processing of information or, more specifically, the processing of data by means of electronic computers" (2020, translation by the author). This word thus seems easily translatable as either "information technology" (i.e., information science) or "computer science" (i.e., computational science). However, the consultants use "information technology" to refer to the use of information technology in management and infrastructuring, rather than to the discipline of information technology. Therefore, I chose the broader term "information technology".

3 Centro Interateneo per le Tecnologie dell'Informazione e della Comunicazione nella Ricerca e nella Didattica (Interuniversity Centre for Information and Communication Technologies in Research and Teaching).

4 Servizi, Applicazioni e Tecnologie Informatiche della Sapienza (Services, Applications and Information Technologies of Sapienza).

5 CITICoRD and SATIS were formed as a reorganisation of the older Centro Interdipartimentale per il Calcolo Scientifico - Interdepartmental Centre for Scientific Calculation (CICS).

2001 as well – was an administrative body where 75 IT specialists worked. It managed the Sapienza web portal, its telephone network, the e-mail services, the applications for accounting and student careers management, the network infrastructures connecting the branch offices, and all the services for the Central Administration and its network in particular. CITICoRD and SATIS collaborated since 2001 in the development and management of IT projects and services of interest to Sapienza. They were both represented in the Governing Bodies.

The first experiences of informatisation in Sapienza took place within these organisations. In 2002, an 'e-Learning project' was launched within CITICoRD using the Moodle LMS (§ 3.3). In 2005, 180 courses had already been created by more than 170 professors from 16 different faculties with around 5.500 students attending.

These initiatives were conducted as an artisanal and precarious 'doing'. In a Skype interview, a consultant who worked at CITICoRD told me some 'war stories' (Orr, 1990) about those times:

> We set up Moodle with internal resources (…) with a lot of problems, because the contract of the fellow from the Information Technology faculty lasted only for a specific number of months and then we had to explain everything to the new fellow all over again (…) I did the teaching support because no one else could (…) once, during the Christmas holidays, the server went down because the 'cavity' flooded. A few power supplies went down, but not the machines. No one would have gone [to see what had happened]; luckily, I had the badge to access the computer room. I went there and pulled the switch. (InfoSapienza IT Specialist D)

> There was no such thing as a disaster recovery plan that requires backups in two separate locations. (…) The sewer pipe passed through the administrative computer centre. One day, it blew up: it was a mess. (InfoSapienza IT Specialist D)

Among these pioneering artisanal projects is the development of two further platforms that would have had great relevance in the following years at Sapienza. In 2003, the Auselda software house was entrusted with the development of a customised system for the management of students' careers; five years later, InfoStud (§ 5.4) would emerge from this project. In 2004, GOMP (§ 5.3) was tested to comply with the new publicity needs for degree courses required by Ministerial Decree 270/04. Initially intended for the Faculty of Architecture only, the software was then extended to the entire university after an intense work of customisation and co-design:

> That job took several years of work, both for that company [Be Smart] and for Sapienza's staff. A working group [was set up] that, for four years, met basically every week for half a day with Be Smart to identify what had to be implemented and to verify that it worked correctly (InfoSapienza IT Specialist C)

Hence, at the time, information technology at Sapienza was practised through scattered, fragmented, local, poorly coordinated and scarcely communicating experiences. It thus was more like a *craftsmanship practice* than a theme firmly positioned and manoeuvred within a political agenda – it was not yet an idea (Czarniawska & Joerges, 2011) sedimented and circulating across internal and external networks.

6.2 2008-2014. OUTSOURCING PLATFORMS: A management-oriented idea of information technology

In 2008, several events took place that are relevant to this exploration. The project for Centro InfoSapienza was presented and, with the new rectorate, the agenda shifted towards a greater focus on information technology and management-oriented discourses.

6.2.1 From 'Area ICT' to 'Centro InfoSapienza': Materialising informatisation

During the Academic Senate session of 24 October 2007, the Vicar Pro-Rector and the Pro-Rector for Personnel Policies were invited by Rector Guarini to present a proposal for the establishment of an Information and Communication Technology Area. These two Promoters problematised the issue (Callon, 1984) by constructing a scene with a problem and two actors playing a role in it:

- The Sapienza Governing Bodies[6] had paid too little attention to ITs in past years; Sapienza was therefore lagging behind other universities. Information technology's management had been too "technical" and there was a lack of "a place where to steer the information technology policy of Sapienza (…) in terms of research, teaching and administration needs" (Sapienza, 2007);
- despite the excellent results with respect to resources, the SATIS/CITICoRD pair was poorly coordinated and did not meet the requirements to be effective.

The promoters staged the ICT Area project as an obligatory point of passage (ivi) to solve both problems. Such initiative would indeed have led to a unification between SATIS and CITICoRD and, thereby, it would have made possible to "ensure maximum efficiency in the management of services, effectiveness of coordination and excellence in innovation processes, as well as speeding up operational and management action" (Sapienza, 2007).

Right after the analysis, the promoters moved to their proposal, which they framed as "surely innovative", since "nothing similar exists in these terms within Sapienza" (Sapienza, 2007). The uni-

6 In Sapienza, the Governing Bodies (Organi Collegiali) are the representatives for the internal components of the university. They are composed by the Academic Senate (Senato Accademico) and the Board of Directors (Consiglio di Amministrazione).

fication project envisaged a division of competences between two bodies:

- a Functional Area with management tasks, which would integrate and absorb the competences and attributions of SATIS and CITICoRD (operational, service and planning tasks for the elaboration and dissemination of electronic information in Sapienza);
- a Committee to determine Sapienza's information technology policy in accordance with the university's strategic objectives. The Committee would be composed by the governance and some representatives of the IT 'users': Rector, Administrative Director, representatives of the Federal Universities, students, Head of the InfoSapienza Area.

To stimulate interest in the parties and pursue their enrolment strategy (Callon, 1984), the promoters proposed a discursive framing through which the Senators could make sense (Weick, 1995) of the new 'information technology' idea. According to such representation, "information management" had to be considered as an area of "strategic importance" in "modern society (…) [and] in particular for a university of the size of Sapienza" in order to "respond to the current – and, above all, the future – needs of research, teaching, administration and all evaluation activities" (Sapienza, 2007); "today, this area (…) is fundamental and strategic, and will increasingly be so" (ivi) – from a financial point of view too, given the weight of 'knowledge management' on the Ordinary Operating Fund provided each year by the MIUR. The proposed organisational scheme was further legitimised by referring to its adoption at other Italian universities (Bologna and Naples).

The organisational model produced by the promoters thus emerged as a device of *interessement* (Callon, 1984) through which they could translate the heterogeneous interests of the Governing Bodies into their own. Emerging as a result of their negotiations with Sapienza's internal regulations and with trade unions, such device was to achieve a twofold aim: on the one hand, to lead to

the complete coordination of SATIS and CITICoRD, since they would become a single entity; on the other hand, and through that, to increase its relevance in Sapienza, especially from a political point of view.

The device triggered lengthy discussions in the Governing Bodies as well as a counterstrategy by a group of technical actors, i.e. IT academics and IT technicians from CITICoRD. They proposed a deviation in the organisational model, pushing for the Committee to be made up of IT 'experts' rather than IT 'users' (that is, representatives of the Sapienza Departments). However, the interests binding together the promoters and the Governing Bodies were stronger than the ones between IT experts and the latter. Through this alliance, InfoSapienza – the new, 'friendlier' name for the ICT Area – emerged as a Centre of Administrative Responsibility which *materialised* the vision of the university's information technology as a political and strategic sector. Thereby, an action net (Lindberg & Czarniawska, 2006) emerged around this first idea of information technology in Sapienza, and began attracting actors and artefacts.

6.2.2 New market-oriented meanings and alliances: The actor-network of informatisation

In October 2008, while the translation process was still ongoing, a governance change occurred. The promoters of the informatisation project were not re-elected: rector Guarini's mandate ended, and the new rector Luigi Frati took over; the Vicar Pro-Rector and the Pro-Rector for Personnel Policies changed.

In the electoral programme of the new rector Luigi Frati, information technology was presented as a relevant policy issue and framed within a new sociotechnical and political discourse. Information technology was represented as

> the only tool that (…) in addition to improving overall efficiency (…) can allow for effective control and verification

> of results in real-time, precisely in the proposed scoreboard for indicators (…) to be a pervasive tool, the management of information technology must be *transparent* and *neutral*, as well as *professional*, and must be *under the direct responsibility of the elected Rector* (Frati, 2008; italics in the original text; translation by the author)

Information technology was thus framed within a 'revolutionary' sociotechnical discourse which entwined with the new public management vision: only through the supposed IT revolution can the organisation achieve new levels of efficiency.

This discursive re-framing was supported and stabilised by a renegotiation of the organisational model towards greater autonomy. The form built in the previous discussion phase was restructured according to the new Sapienza Statute. InfoSapienza thus became a "Special Order Spending Centre" endowed with greater autonomy for programming and technological development functions aimed at supporting the University's ICT/Information Communication Technology (Rectoral Decree 2498, 29/07/2011). This governance change was followed, therefore, by a redefinition of the idea of information technology and the discourses that mediated and held the informatisation project together (Pipan & Czarniawska, 2010). The words used in the Rector's programme – and, especially, those emphasised with italics – referred to a managerial and entrepreneurial matrix, focused on quality and accountability, autonomy and control, neutrality, and indicators.

Stabilised in this *management-oriented frame*, information technology could circulate energetically in local practices: this was its most vibrant period. Through information technology, Sapienza – a public institution – could open a quasi-market space that was soon populated by heterogeneous actors. The action net of informatisation at Sapienza became increasingly thick, with new alliances, on heterarchical scales, with private actors and edu-businesses in the engineering, corporate and governance spheres.

One of the most important agreements in this sense was in

October 2009: the CINECA Consortium – a boundary actor between public and private, State and market, technical and political, actor and network (§ 4.1) – was enrolled in Sapienza's information technology network. On the one hand, the agreement[7] was motivated with the need to replace the university personnel management software. On the other hand, a wider frame was mobilised: "an opportunity to join, more constructively and dynamically, to the evolution of the entire university system" (Sapienza, 2009). This important agreement led not only to platform transfers – the U-GOV ERP in 2011 (§ 5.2) and the IRIS CRIS in 2015 (§ 5.1) – but also to the access to a governance network (which includes today almost all the Italian higher education institutions as well as the MUR and ANVUR) and to the participation in managerial and corporate knowledge (§ 4.1).

In 2012, the large infrastructural (Van Dijck et al., 2018) edu-business Alphabet-Google was also enrolled in a big agreement that brought Sapienza into the global market of IT for education and provided to the Sapienza community G Suite for Education the bundle (§ 5.6). An agreement had already been made in 2011 with Google Books for the digitalisation of Sapienza's books *corpus* under the name of Sapienza Digital Library[8] (Di Iorio, Schaerf, & Bertazzo, 2013). In 2013, InfoSapienza acquired the rights of InfoStud from Auselda, which had gone bankrupt. A year later, Sapienza entered – as the first Italian university – into the MOOC platform Coursera (§ 3.1.1; § 4.3), thereby tying itself to another private edu-business of global education.

7 Sapienza's one-off membership fee to the CINECA consortium was EUR 125.000 (Sapienza, 2009). In 2019, Sapienza paid CINECA EUR 1.338.300,36 for the annual licence of its software U-Gov, Titulus, U-Buy, IRIS, BI, P&C (Sapienza, 2019a). Other payments to CINECA in the 2018 budget include EUR 58,000 for electoral services from CINECA to the University and EUR 809.85 for missions of Sapienza staff to CINECA offices (Sapienza, 2019b).

8 Another project of digitalisation of Sapienza's book heritage was ProDigi, started a few years earlier (2006) insourcing some of the University's libraries (Magarotto, Quaquarelli, & Vallania, 2014).

Sapienza's information technology network thus became, at this stage, a localised expression of a global field transferring *managerial knowledge* from the sphere of production (business) to a context of application (education) through more and more human and non-human translators: emerging regulations, new public management discourses, digital platforms for education and management, governance players. In this phase, these actors held the network together and transferred their interests around the university's information technology project.

6.3 2014-2020. INTEGRATING PLATFORMS: From craftsmanship to the market, from doing to not doing

The elections for the rectorate were held again in 2014. In the programme of the new rector Eugenio Gaudio, the topic of information technology was absent. InfoSapienza had a budget of EUR 16.067.385,85 at the opening of the 2018 financial year. EUR 9.270.179,30 were spent in that same year: 67.75% on maintenance and service provision (licences, assistance, maintenance, rentals, utilities, equipment), and the rest for supporting the Central Administration, libraries, and further projects (Sapienza, 2019b). These were not very high figures:

> [Sapienza] didn't spend a lot of money [on informatisation], I can tell you that. (…) some expenses are unavoidable, that is, all the expenses concerning servers, communications, all the infrastructures (…) For a university like Sapienza, [these are] really not significant figures. Sapienza has an annual budget of almost one billion. (Governance actor C)

According to some witnesses, little impetus was given at this stage to InfoSapienza and the informatisation processes in general:

> Let's put it this way: [InfoSapienza] has not been offered a particular boost in recent years, which have certainly not been marked by a further development of technological transformation, nor innovation. (…) Technological transformation and

> innovation have certainly not been a priority of this rectorate. However, it has been maintained and a little expanded what had been done. That is, we live on what has been done. (Governance actor C)

Still, two important software-related projects were pursued. In 2016, an agreement was made with Microsoft whereby students and staff can benefit from Microsoft Office features and applications, free of charge, to support teaching (Sapienza, 2016). The agreement was mediated by the Rectors' Conference of Italian Universities (CRUI), a public consultancy body of the MUR. The *Educational Transformation Agreement* that CRUI and Microsoft negotiated since 2012 (CRUI, 2017) states that Italian higher education institutions can access Microsoft licenses and services by applying to CRUI. This is some sort of public-private partnership between MUR and a big player in the education market, in which the CRUI policy network is positioned as an obligatory passage point.

A second important step was the Board of Directors' resolution 433/2017 (Sapienza, 2017). This resolution determined that the software application managing the students' careers (InfoStud) and the ERP managing teaching programming (GOMP) were to be replaced. The former had "reached the end of its useful life" because maintenance activities were increasingly burdensome and the infrastructure was "show[ing] its inadequacy" in the face of the innovations required by the new processes; the latter lacked "functionalities that are now considered indispensable", and the source code was not available to Sapienza. The resolution let to an agreement with the CINECA Consortium for the creation of a new solution, envisaged as integrated (that is, composed of several interoperable modules that would include the functions performed by InfoStud and GOMP) and customised for Sapienza. The source code was to be owned by CINECA, but Sapienza would be guaranteed access to it and the possibility to modify it for the duration of the contract; in turn, CINECA would have to grant Sapienza

unlimited use of the code itself. The project was to be led by a Steering Committee composed of the highest representatives of Sapienza's governance and CINECA representatives, as well as a Sapienza Project Leader, Technical Commissions, Managers Working Groups with components from Sapienza and CINECA. Resolution 433/2017 was approved by a unanimous vote, and without further discussion, by the Governing Bodies. The timing of the project was estimated at three years in 2017, but to date "nothing[9] has come out of it, not even as design work" (Governance actor A).

This resolution marks the final detachment of the governance from the technical-artisan community of Sapienza, i.e. the internal knowledge texture at InfoSapienza and the local player Be Smart. Software, skills, local communities in Sapienza are the effect of prolonged and stratified processes of organising and infrastructuring, and they are connected at an intra- and inter-organisational level, despite functional separation:

> For us, it is a bit more difficult to interface with CINECA rather than with GOMP, because with GOMP we also interact in person – not daily, but basically weekly. With CINECA (…) there is more of an epistolary interaction, and we speak by phone; you know, it's not the same thing. And CINECA, as a consortium, manages 70 universities (…) Just as Sapienza files

9 However, money is being set aside: "The project for the development of the new system for teaching and managing the students' careers is a well-known initiative to the Board of Directors. The technical-economic details for this collaboration are currently being defined; however, on the basis of a rough estimate, Centro InfoSapienza has set aside funds, amounting to EUR 700.000,00 (to date), in advance to the start of the project. The first indications deriving from the draft of the collaboration agreement outline an economic framework that will require an investment, already in the first year, of about EUR 1.400.000,00, hence the need for a supplementary allocation of Euro 700.000,00" (Sapienza, 2019b, translation by the author). A governance actor reports that s/he was asked to "resume discussions as soon as possible (…) because the InfoStud system is suffering from old age" (Governance actor A).

> a request, Bologna, Milan, etc., do that too; and CINECA puts you in the queue. (InfoSapienza IT Specialist B)

> [We at Be Smart] used to meet with InfoSapienza once a week, or once every two weeks, in Sapienza, to analyse and draft missing features, and so on. Sapienza told us its needs. We did the analysis and pulled out the specifications. We wrote tons of material. Sapienza approved it and we implemented it. (Be Smart IT Specialist)

Resolution 433/2017, however, expresses a preference for the *integration* of these actors and processes into a single external big player from the market – and the consortium network – namely CINECA. The technical community of Sapienza reacted with discontent to the abandonment of its internal know-how. The consultants I talked to did not hide their bitterness:

> Let's say that when the choice was made for CINECA – we were not happy with it. By now we have got used to it, and we go on – we are paid to work (…) This choice shows that they have failed to grasp the professional value they have within InfoSapienza. Manifestations of esteem can be of many kinds, but the ones that count are of a practical kind – the facts count. You tell me I'm good, but when it comes to investing, you trust someone from outside… (…) Please, don't tell me then that Sapienza invests in professionalism. That is, you get a PhD, and you're good at it. Then, when you've finished it, I'll call someone else instead of making you work – what would you say? (InfoSapienza IT Specialist A)

Be Smart is a competitor and market player, yet it is also part of a shared history with InfoSapienza which revolves around co-participated craftsmanship and customisation. Indeed, Be Smart too experienced a betrayal in the overall conduct of Sapienza:

> The story, to sum it up, began with a communion of intent and a very strong desire to do things together, at the beginning. (…) It was a very happy period (…) with a very high harmony in working together, because seeing each other every

> week also produces a highly personal relationship. So, when we needed something urgently, we didn't stand there and began discussing. We just did it – in the evening, on Saturdays and Sundays. Then (…) things went badly (…) we all felt bad (…) The relationship with a part of Sapienza's governance was certainly a bit ruined, but not for technical reasons or anything. Simply because of a different vision of where Sapienza wanted to go. (…) Diligently, we cannot do anything but what they ask of us. (Be Smart IT Specialist)

Despite having limited time, InfoSapienza continues with a rich production of 'mandatory' and everyday innovations:

> We kept innovated because (…) the only motivation you can give to professionals to continue working is to innovate. Otherwise the professional leaves – she gets bored. So (…) innovation was mandatory, because in any case the application had to evolve, and (…) people also had to evolve. (InfoSapienza IT Specialist A)

Overall, the governance chose to detach from the local and artisan knowledge that once laid the foundations for Sapienza's infrastructures and proceed towards the outsourcing of processes and services to a big market player. A *single, integrated system from the market* was thus preferred to separate pieces of software intertwined through artisan tinkering. The information technology project, as a consequence, lost energy altogether and was carried out as mere compliance and with a 'just-get-it-done' orientation (Landri, 2000). Promoters, policy entrepreneurs and windows of opportunity (Kingdon, 1984) vanished, as information technology drifted from being a black box stabilised around new public management discourses to becoming an elusive label that was hardly even present in organisational discourses.

6.4 2020-?. BUYING-AND-(RE)MAKING PLATFORMS: The Covid-19 emergency and the repositioning of ITs

Covid-19 entered the Italian political agenda from the last days of February 2020. With the Prime Ministerial Decree 11/03/2020, a nationwide quarantine phase began – the 'phase 1' of the fight against the 'novel coronavirus' – which would have eased only in the early days of May (§ 7). At least from that moment on, the Covid-19 emerged as a social actor capable of making visible – and sometimes of accelerating – processes that were already in motion in the Italian social and political life (Giancola & Piromalli, 2020).

The field of education had previously been the subject of regulatory interventions with the former Prime Ministerial Decree 04/03/2020 which, among others, had suspended classroom activities in schools and universities. A broader exploration of the effects of Covid-19 on higher education in Italy will be presented in Chapter 7; I now focus on how the pandemic has effected the informatisation processes at Sapienza.

6.4.1 'Phase 1': Adaptation through the market

In 'phase 1', the governance of Sapienza directed its efforts towards the adaptation of its educational offer to distance teaching – in Italian, *Didattica a Distanza* (DaD) – for approximately 550 classrooms, 3.500 students, 102.700 students in A.Y. 2019-2020 (Sapienza, 2020a). This was a phase of adaptation and adjustment to the sudden change in the foundations of teaching. Among the first actions in this regard, a "Working Group for the definition of procedures for distance learning, examinations and degrees" was set up, as well as a "Working Group for the development of information technology to support distance learning". On 6 March, Sapienza published the document *Easy-to-use technologies for distance education*. As privileged witnesses report, the choice of tools was guided by the 'principle of the alternative' rather than rigidity:

> Sapienza is a very large and heterogeneous reality (…) So, we selected some tools and said: "We provide you with alternatives". Some [of the alternatives] are those suggested and, as such, are guaranteed by Sapienza (…) We did all of this without adopting a logic of extreme rigidity, because if a professor wanted to try another instrument she was not denied. Other universities said instead: "That's the platform – full stop" (Professor, Faculty of Communication Science)

In determining the range of options to be offered to professors, internal solutions and market products were considered. Among the market solutions, Sapienza's recommendations include Google Classroom and Google Meet (§ 5.6) as well as Moodle (§ 5.5) – although for the latter:

> Sapienza decided not to suggest using it so much (…) Even before the emergency, we had already reached the maximum user capacity. The indication given was: "Use Moodle if you are already a user" (Governance actor A).

It was decided not to recommend the Microsoft Teams package, which was available in Sapienza, or Zoom Video Communications, which was not[10]. As to Sapienza's 'in-house' suppliers, no offers were received from Be Smart, and no new products were commissioned to InfoSapienza. Instead, information was exchanged with Unitelma, the Sapienza-promoted virtual university (§ 4.2). Therefore, the governance chose to carry out the adaptive digitalisation processes of 'phase 1' through *external and private mar-*

10 At the end of September 2020, Sapienza purchased the license for the Zoom videoconferencing platform "in order to provide an easy and advanced tool to support blended teaching activities and the organisation of online sessions" (Sapienza mailing list; translation by the author). The comment of an educational tutor at Sapienza illuminates the issue of interoperability (§ 8; § 9) in everyday life: "But will it be possible to continue using Google Meet? Well, this is another complication… You know, we use Google Classroom to invite the students to the lessons" (personal communication). The acquisition of the Zoom license and its use in teaching practices is an element of interest that, for reasons of time, could not be examined in this paper.

ket networks. The commercial edu-business Alphabet-Google thus (re)positioned itself in the largest Italian higher education institution, becoming indispensable at the organisational level (§ 9): "Google has saved us. Google saved us because it gave us all these services for free, and within a contract. (…) It is saving us now" (Governance actor C).

6.4.2 'Phase 2': Reacting by 'making'

The 'phase 2', characterised by the 'easing' of the Covid-19 containment measures, symbolically began with the Prime Ministerial Decree 04/05/2020, issued after an improvement in the contagion curve in Italy. At Sapienza, this phase lasted from 4 May to the end of August 2020 and brought a change in the rules for lessons and exams: lessons still had to be carried out online, while exams could be conducted in blended mode starting from July 2020. This, in Sapienza, was a phase of active reaction to the emergency, in which a great effort was made to identify new needs and translate them into practice. In this sense, the InfoStud platform – which, as observed (§ 5.4), is used by both professors and students – was subjected to ongoing re-making endeavours within InfoSapienza in order to deal with day-to-day emergencies:

> It was not always easy to see the ID card from the camera, because the camera of the students' computers is often not optimal. Given the need, within a short time InfoStud has implemented a function for which the secretariats uploaded the ID cards of the students and we [professors], when opening the call, can now find a photo of the document already certified by the offices. (Governance actor A)

Market solutions persisted in the form of digital platforms suggested from the top and already used in practice, but the artisan community of InfoSapienza and Be Smart received renewed recognition:

> The strong side of InfoStud in my opinion? That it is an internal product, so if you need to make a change you can do it. (…) Something that becomes urgent and absolutely unpredictable can be managed, if there is a product that can be easily handled from the inside – or, in the case of GOMP, if there is a company whose staff is dedicated to Sapienza only and that can go after all these needs. (Governance actor D)

The 'making' received a renewed appreciation in this second phase because of its flexibility and versatility. The internal InfoStud software is a more open epistemic object (Knorr-Cetina, 2001) than any piece of software purchased from external suppliers:

> Of course, we always reflect on "is it better to have an internal system? Is it better to go on an external system? Better to go to CINECA, which runs on a lot of universities, or not…?". On the basis of the experience gained in this period, when needs have changed quite quickly, I believe that in a large and slow university like Sapienza, the best solution today is to have a centre or a specialised company t has a constant and direct collaboration with the university. (Governance actor A)

6.4.3 'Phase 3': Back to the classrooms?

'Phase 3' of 'cohabitation' with Covid-19 started in September 2020. At the time of writing (November 2020), it is still early for a thorough evaluation of this phase; however, it is possible to propose some preliminary observations. In § 7.3, I examine some elements of the communication and the institutional discourse in the last phase of the crisis; subsequently, I explore relevant aspects of the informatisation of Sapienza at that stage.

The preparation for the 'third phase' required a political commitment to the objective of digitalisation and an unprecedented financial investment from Sapienza. Teaching was held in blended mode. In particular, a 'rotation' mode was arranged so that all the courses scheduled for the first semester of the A.Y. 2020-2021 were offered simultaneously in classroom presence and at a dis-

tance. The classroom modality was offered through turns based on the student's registration number and booking software[11], while the remote mode was offered through streaming on Google Meet.

The technical infrastructuring effort (Fig. 24) for the blended teaching mode required an unequalled investment in IT equipment (Tab. 4). It was an investment both in hardware (equipment for classrooms, laboratories, libraries; enhancement of Wi-Fi devices; purchase of smart working devices for users who did not have them) and software (investments for pre-existing applications and new initiatives) amounting to almost 6.5 million euros, 50%

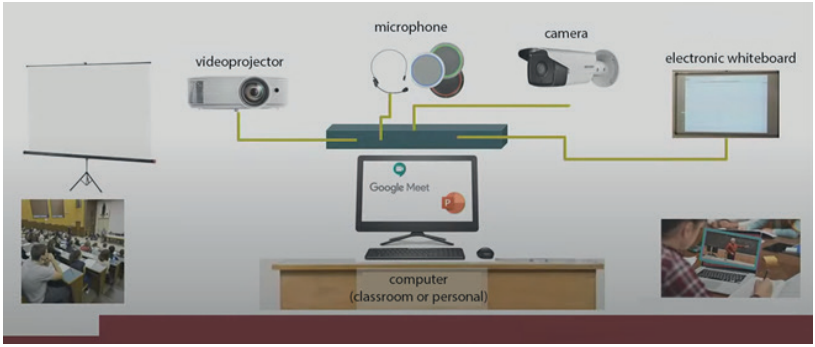

Figure 24. The digital infrastructure envisaged for the 'Sapienza' classrooms in the 'phase 3' of the Covid-19 pandemic (source: translation by the author from Sapienza, 2020)

11 ProDigit (Portal for the Management of Natively Digital Procedures) is the web portal that enables the booking of seats for classroom teaching in Sapienza (Sapienza, 2020e). Logged in users can book their seat by selecting the building code and the time slot of interest (exclusively for the week related to their turn). In addition, the software elaborates a waiting list that allows students to attend in presence even if it is not their turn. After registering, students receive confirmation of seats availability in the classroom. If a seat becomes available, the student is notified via email. The launch process for the software has been quite troubled. Its testing led to a one-week postponement of the start of lessons in the whole Sapienza in September 2020. In October 2020, the Sapienza in Movimento student association pushed for the ProDigit functionalities to converge within InfoStud, and for the Departments of Engineering and Computer Science to take control of the project. This is an interesting case of a digital actor (at the centre of an interoperable network; § 9) deserving of further investigation.

co-financed by the Ministry of University and Research.

OBJECT	AMOUNT IN EUR
Classroom equipment	4.132.000
Workstations for teaching rooms	500.000
Workstations for libraries	160.000
InfoStud App	150.000
Moodle extension	100.000
Software tools	30.000
Cloud Services	50.000
Sapienza Accoglie [Guidance days at Sapienza]	40.000
Videoconferencing platforms	100.000
Smart working devices	975.000
Software platform for placement	100.000
Wi-Fi control equipment upgrades	150.000
TOTAL	6.487.000

Table 4. Initiatives of 'Sapienza' in information technology during the 'phase 3' of the Covid-19 pandemic and financial amount (50% co-financed by the MUR; source; Sapienza, 2020)

The emergence of Covid-19 has marked a turning point in the events of Sapienza's informatisation. The transition to distance teaching (§ 7) required the governance to make a major political and financial commitment to information technology, which had until then been framed in a marginal role. This effort was oriented in a twofold direction. The 'buy' orientation that had characterised the governance of information technology since 2009 persisted during 'phase 1', in which institutional action was aimed at adapting and resisting to the sudden change. By contrast, in 'phase 2', the 'make' received new impetus – via the use and development of Sapienza's internal products – as it allowed to react to the emergency through on-the-fly customisation of local products. In 'phase 3', major financial investments and political commitment to the digital issue might bring forward transformations that are

yet to be explored.

This long history between local and global, craftmanship and markets, could somehow account for the complex 'social life' (Appadurai, 1988) of information technology and its materialisation at Sapienza. In this chapter, I have identified four phases through which the project of information technology at Sapienza can be retraced, while also considering its varied energy, actors, and directions.

In the first phase (2000-2008), 'proto-informatisation' initiatives were carried out by dispersed pioneers, as an 'artisanal' enterprise. This phase lasted about eight years, after which a period of strong expansion opened up (2008-2014). With the new rectorate, the project was framed into new public management discourses and became the focal point for a network assembled around market-oriented alliances. Sapienza's craftsmen (InfoSapienza and Be Smart) lost ground to big Italian and global stakeholders (CINECA, Google, and Coursera) that were enrolled to outsource the digital transformation of the university. A change in governance followed (2014-2020), with information technology no longer among the university's priorities. The new governance distanced itself from Sapienza's technical IT internal knowledge and integrated internal software solutions into a single product to be outsourced to a big national player. Sapienza's artisan community suffered from this decision, which experienced as a betrayal. The Covid-19 emergency in 2020 caused an abrupt interruption of this outsourcing process. The one we are living is a period of urgency and change. On the one hand, Sapienza confirmed its trust in Alphabet-Google, as its tools were selected for distance teaching; on the other hand, the local knowledge embodied by InfoSapienza and Be Smart received renewed recognition for its flexibility and ability to customise software applications 'on-the-fly'.

In this twenty-year-long story, tensions seem to emerge that exceed the contingent case study. Indeed, the processes explored

in this chapter concern global actors and discourses entering into a local dimension. A complex encounter has indeed taken place between a stratified community of practitioners which emerged from below through continuous artisan efforts and new global actors possessing economic and managerial knowledge. This does not sound like an original storyline: education, today, is everywhere heading towards marketisation (§ 1.1.3). However, the case study shows how these dynamics also infiltrate the governance and micro-policy of higher education in a variety of ways, shaping actor-networks and business relationships.

Various questions are still to be explored in this field, which the persistence of the Covid-19 pandemic will probably contribute to disrupting. One of them, for example, concerns the forms of teaching and learning adopted during 'phase 3'. Studies could be performed in order to explore whether the huge financial investments on IT have been accompanied by an adequate and well-timed reflection on education; the danger is indeed of taking for granted that a technical fix will make things better, without thinking enough on the ends we want to pursue and why. Further studies will be able to ascertain if a transmissive idea of education and learning has once again been inscribed into the teaching organisation and the sociomaterialities rearranged during the Covid-19 emergency – and, if so, how this idea of education is made operative and/or resisted by the professors. At present, most students attend the lessons from home, while the students in the classrooms must practice social distancing and professors must remain on the webcam range (which also raises important questions about datafication). Still, innovative teaching practices that integrate technology into experimental trajectories can produce new forms of student-centred and participatory teaching.

The governance of the informatisation project in Sapienza has been characterised by choices reflecting broader visions of the world. Mostly, these choices have been in line with the marketisation trends now prevalent in global higher education: from the

privileging of outsourcing, to the decision of integrating local applications, up to the choices made during the emergency period. This is also the case of the decision of adopting Alphabet-Google. Alphabet Google, a global and private edu-business, thanks to this choice had the opportunity, during the pandemic, of strengthening its power, while free and open source solutions – e.g., Kaltura (2020) and Moodle (2020) – were already available and would have been more in line with the democratic and open character of a public university such as Sapienza. Indeed, what is at stake now are not only the tensions in the texture of universities as organisations but, most importantly, the orders of value (Thévenot, 2001) they perform as public institutions.

ENGAGING WITH PLATFORMS

PRACTISING ONLINE TEACHING DURING THE COVID-19 EMERGENCY

7

On 30 January 2020, the World Health Organization declared the 'novel coronavirus' as a public health emergency of international concern (WHO, 2020). According to a retrospective study published in March 2020, about 6.000 people had developed symptoms in China by 20 January; on 24 January 2020, a report published in *The Lancet* discussed a "pandemic potential" for the virus (Huang et al., 2020). The 'wet markets' in the Chinese province of Wuhan thus became widely known in the West as well. After a few weeks, SARS-nCoV-202 exploded all over the world.

The pandemic brought rapid and unforeseen effects on education on a global level. In Italy, the health emergency struck first and the hardest in Europe: kindergartens closed, distance teaching was introduced, university exams had to take place by videoconferencing. The emergency provoked crises and deadlocks into the worlds of higher education, and made apparent its vulnerabilities and invisibilities. Alongside these issues, new practices have emerged that confirm the ability of institutions and practitioners to improvise in uncertainty and innovate consolidated processes.

In this chapter, I examine both of these aspects by analysing of online teaching during the Covid-19 emergency in Italy. I shall conduct my inquiry by means of a practice-based and proximal approach (Landri, 2012; Giancola & Viteritti, 2014; Hager & Halliday, 2006). First, I frame the SARS-nCoV-2020 virus from an ecological point of view and describe the management of the pandemic crisis in Italy (§ 8.1). I then move to observing emergency higher education processes in the national arena. In the

subsequent paragraph (§ 8.2), I review some processes and instances on the local and global levels. I then focus on the local case of the 'Sapienza' university (§ 8.3) to observe the discursive frames within which the emergency has been communicated during the various phases of the crises. I also describe some organisational, teaching, and informal practices that have emerged in the empirical field (§ 8.4). Lastly, I focus on the engagement of professors with the sociomaterialities of online education (§ 8.5).

7.1 THE EMERGENCE OF SARS-NCOV-2020: An entanglement of living entities

At the time of this writing (29 September 2020), 1.007.259 deaths, 65.344 critical cases and 24.904.364 recovered people are reported on the global level since January 2020. Currently, the American continent appears to have been hit the hardest by the pandemic (Tab. 5)

Table 5. Deaths, serious/critical cases, population in the ten States with the highest deaths due to SARS-CoV-2 by 29/10/2020 (source: Worldometers, 2020)

	TOTAL DEATHS	CRITICAL CASES	POPULATION
USA	209.815	14.065	331.478.677
Brazil	142.161	8.318	212.929.158
India	96.378	8.944	1.383.308.133
Mexico	76.603	2.344	129.262.198
UK	42.001	262	67.973.563
Italy	35.851	264	60.439.744
Perù	32.324	1.354	33.082.847
France	31.808	1.118	65.309.161
Spain	31.411	1.529	46.759.262
Iran	25.986	4.079	84.253.298

However, this story began long before the winter of 2020. According to the predominant theory (Novel, 2020; Ye et al., 2020), SARS-CoV-2 is a zoonotic disease, i.e. an animal infection transmissible to humans – just like AIDS, Ebola, SARS, anthrax, and several other epidemics. In particular, the 'novel coronavirus' is considered as the effect of a bat-to-human spillover occurred via the processing of bat carcasses and guano in the production of traditional Chinese medicines (Wassenaar & Zou, 2020)2019_nCoV (now named SARS-CoV-2. All living entities – humans and non-humans – are therefore entangled together in this story. Humans are both the victims and the responsibles for the planetary trouble: "there is no outside from which to govern the pros and cons. We all are fully involved in local and extensive connections, whose human-produced effects become the environment for other elements, and the effects produced by other elements become the environment for humans" (Viteritti, 2020, p. 252; translation from Italian by the author). As argued by David Quammen:

> We should appreciate that these recent outbreaks of new zoonotic diseases, as well as the recurrence and spread of old ones, are part of a larger pattern, and that humanity is responsible for generating that pattern. We should recognize that they reflect things that we're doing, not just things that are happening to us. We should understand that, although some of the human-caused factors may seem virtually inexorable, others are within our control.
> The experts have alerted us to these factors and it's easy enough to make a list. (…) We have penetrated, and we continue to penetrate, the last great forests and other wild ecosystems of the planet, disrupting the physical structures and the ecological communities of such places. We cut our way through the Congo. We cut our way through the Amazon. We cut our way through Borneo. We cut our way through Madagascar. We cut our way through New Guinea and northeastern Australia. We shake the trees, figuratively and literally, and things fall out. We kill and butcher and eat many of the wild animals found there. We settle in those places, creating villages, work camps,

towns, extractive industries, new cities. We bring in our domesticated animals, replacing the wild herbivores with livestock. We multiply our livestock as we've multiplied ourselves, operating huge factory-scale operations involving thousands of cattle, pigs, chickens, ducks, sheep, and goats, not to mention hundreds of bamboo rats and palm civets, all confined *en masse* within pens and corrals, under conditions that allow those domestics and semidomestics to acquire infectious pathogens from external sources (such as bats roosting over the pig pens), to share those infections with one another, and to provide abundant opportunities for the pathogens to evolve new forms, some of which are capable of infecting a human as well as a cow or a duck. We treat many of those stock animals with prophylactic doses of antibiotics and other drugs, intended not to cure them but to foster their weight gain and maintain their health just sufficiently for profitable sale and slaughter, and in doing that we encourage the evolution of resistant bacteria. We export and import livestock across great distances and at high speeds. We export and import other live animals, especially primates, for medical research. We export and import wild animals as exotic pets. We export and import animal skins, contraband bushmeat, and plants, some of which carry secret microbial passengers. We travel, moving between cities and continents even more quickly than our transported livestock. We stay in hotels where strangers sneeze and vomit. We eat in restaurants where the cook may have butchered a porcupine before working on our scallops. We visit monkey temples in Asia, live markets in India, picturesque villages in South America, dusty archaeological sites in New Mexico, dairy towns in the Netherlands, bat caves in East Africa, racetracks in Australia—breathing the air, feeding the animals, touching things, shaking hands with the friendly locals—and then we jump on our planes and fly home. We get bitten by mosquitoes and ticks. We alter the global climate with our carbon emissions, which may in turn alter the latitudinal ranges within which those mosquitoes and ticks live. We provide an irresistible opportunity for enterprising microbes by the ubiquity and abundance of our human bodies. (Quammen, 2012, p. 475, italics in the original text)

The global emergence of Covid-19 speaks volumes about the urgency of the climate crisis and its connection with apparently distant plans and artefacts (Latour, 2020), as well as the necessity for humans to learn to stay with the trouble (Haraway, 2016) of living and dying together with non-humans on a damaged earth.

7.1.1 The management of the Covid-19 emergency in Italy

As mentioned, the Italian territory was hit by the Covid-19 emergency first in Europe. The initial cases – two tourists from China – were confirmed on 30 January 2020. The following day, the Italian Council of Ministers declared the state of national emergency for health risk (Consiglio dei Ministri, 2020).

Just under a month later (21 February 2020), an outbreak of Covid-19 was detected in Lombardy. Shortly afterwards, a second outbreak was detected in Veneto. Decree-Law no. 6 of 23/02/2020 (Gazzetta Ufficiale, 2020) was passed which quarantined eleven municipalities in the provinces of Lodi and Vo', thus prohibiting all social gatherings (schools, demonstrations, non-essential commercial activities, etc.). In the following days, cases were reported in every Italian region. The government attempted at facing this dramatic contingency with a further normative effort. On 25 February, a Prime Ministerial Decree[1] (DPCM) was passed, which extended the validity of the previous Decree-Law to the whole Northern Italy. The Covid-19 virus thereby entered directly into the everyday lives of a significant part of Italian citizens.

However, Covid-19 would directly impact the whole of Italy only by March, when the death toll further worsened. On 4 March 2020, Premier Giuseppe Conte announced on live televi-

1 In the Italian legislative system, a Prime Ministerial Decree (DPCM) is a ministerial decree issued by the President of the Council of Ministers. This type of administrative act has been frequently used during the Covid-19 emergency as it does not require any parliamentary passage for its enactment. It is thus considered as a rapid and agile tool.

sion a new DPCM which opened the 'phase 1' of the 'novel coronavirus' containment. Educational and academic activities were suspended, stadiums were closed, access for relatives and visitors to health facilities as well as penal and juvenile institutions was regulated. With the '#IoRestoACasa' (#IStayAtHome) Decree (11/03/2020), the quarantine was extended to the entire Italian soil. Common retail commercial activities, educational activities and catering services were suspended; gatherings of people in public places were banned. On 22 March, it was forbidden to move between municipalities except for proven working needs, absolute urgency, or health reasons.

On the evening of 26 April 2020, in the light of the epidemic curve falling from its peak, the Prime Minister announced the start of a 'phase 2', in which the containment measures were loosened. The new DPCM 04/05/2020 allowed visits to relatives in the regional territory and the reopening of some productive activities and places of aggregation. In this phase, the *Immuni*[2] contact tracing app (d'Albergo & Fasciani, 2020) was launched. The 'phase 3' of 'coexistence' with SARS-CoV-2 opened with DPCM 15/06/2020. In this phase, the containment measures were further relaxed, with the reopening of additional commercial activities and gathering areas.

2 At least in its early stages, *Immuni* was not warmly received by the Italian population. As of 3 October 2020, *Immuni* has been installed in 6.757.827 smartphones, that is, 17% of those used in Italy (Della Sala, 2020). Immuni is an interesting empirical object that would deserve further empirical observation. It should be noted that such app – as well as the other European contact tracing apps – is at the centre of a transnational interoperational (§ 8; § 9) network which interconnects both public and private actors. On the one hand, between April and September 2020 a framework was jointly developed by Apple and Google for the exposure notification system which provides interoperability among operating systems (iOS/Android) and States (Google, 2020b). It is thus possible for willing States to just configure the interoperable framework rather than develop standalone apps. On the other hand, EU Member States have agreed on a set of technical specifications to ensure interoperability solution for mobile tracing and warning apps

7.2 EMERGENCY HIGHER EDUCATION IN ITALY

On 24/03/2020, in the heart of 'phase 1', CRUI published a report on the state of online education (CRUI, 2020). At that time – just over a week after the suspension of classroom education – half of the Italian universities were already offering at least 96% of their lessons for that semester in distance learning mode. Also, considering the universities that provided at least 90% of their lessons through online teaching, 64% of the student population could access to at least 90% of the lessons they would have received with classroom teaching. These results are not unsatisfactory in numerical terms; nor, according to Francesco Ramella and Michele Rostan (2020), they are from the point of view of professors. They also highlight the internal efforts of Italian universities and the coordination between them. However, this snapshot selects only a part of a complex and fluid process, partly improvised and partly orchestrated, in which governance actors, institutions, and other heterogeneous actors encountered on varied scales.

7.2.1 Gaps and detachments among higher education institutions

The reaction to the pandemic crisis by the governance and institutions of the Italian higher education has brought to the light contradictions, disparities and disconnections whose ultimate roots lie in the local higher education system.

Overall, the emergency has revealed both the fragility of the local system (an overload of work on technical-administrative structures and teaching staff, a deficit in professors training, an 'impoverishment' of teaching methods) and its perhaps unexpected reactive capacity (Ramella & Rostan, 2020). The crisis has also revealed the unequal ability of educational institutions to navigate the emergency. The activation of the online modality seems con-

(European Union, 2020); national app will thus work seamlessly when users travel across EU national borders.

nected to the universities' starting conditions: financial resources, legal constraints (state/non-state/virtual universities), local knowledge (technological, communicative), etc. Some universities were already highly focused towards online teaching: Politecnico di Milano, Università Federico II di Napoli, Università Cattolica del Sacro Cuore, Università degli Studi di Padova, etc. This is also the case for the Italian virtual universities (§ 5.3) into which 6.6% of Italian university students were enrolled in A.Y. 2018/2019. The emergency phase was possibly tackled with greater vigour in such cases of institutionalised online teaching and organisational practices.

The mentioned CRUI report also shows the role played by private actors in the pandemic contingency. Microsoft Teams was the most used platform in the 51 universities surveyed, with almost 500.000 students serviced. It was followed by Cisco WebEx, Google Meet, Microsoft Teams plus Google Meet, and Blackboard. Commercial actors and edu-business, therefore, (re) positioned themselves in educational institutions (Williamson & Hogan, 2020) through the window of opportunity disclosed by the pandemic and diverse strategies: free software upgrades to the educational institutions which had adopted the 'basic' software (Google G Suite for Education), negotiations with non-state universities (Cisco WebEx and Blackboard), public-private partnerships (the Educational Transformation Agreement between CRUI and Microsoft). Lock-in relationships and patterns of dependencies might thereby emerge at the organisational and governance level: market actors may become indispensable for institutional higher education, thus favouring some sort of 'soft' reconfiguration of the relationships between the public and private sectors.

Further tensions develop between higher education institutions and professionals as the "stable high ground" of "solvable problems" is confronted with the "daily swamp" of practices (Schön, 1983). First of all, the ministerial indications proved to be (at least initially) vague and ineffective. The rhetorical construction about

the 'digitalisation of teaching practices' hardly found its way into real-life practices, whose strong heterogeneity is connected to the diversity in territorial infrastructures, institutional and familiar/individual resources, local educational leaderships, reactivity of the teaching staff, etc. Therefore, the gap widens between the sphere of politics and that of situated practices and micro-policies (Ball, 2012). Institutional actors, edtechs, teaching staff, families and students thereby converge in a social field whose equilibria are changing both at the macro and at the local levels (Giancola & Piromalli, 2020).

7.2.2 The social actors: Teaching staff, homeschoolers, academics

These processes do not take place in a vacuum. Within heterogeneous social worlds, social actors mobilise in multiple directions to reinvent their practices.

A key set of actors is the *teaching staff*. The pandemic crisis brought out the crucial role of teaching (Ramella & Rostan, 2020) which is often taken for granted in higher education (Hoidn, 2016; Viteritti & Pompili, 2020). Empirical research on the professors' experience during the Covid-19 emergency is still scarce. However, the 'map' proposed by the Lab-ED (see below) is interesting, as it attempts to trace the varied visions and theories of action of teachers working in Italian schools during the pandemic (Landri, Grimaldi, & Taglietti, 2020a). The map could be applied also to the field of Italian higher education field, even beyond the local context. The first position identified by the authors is that of 'stylites'. The 'stylites' see the Covid-19 emergency as some sort of 'end of the world', since it disrupts what they considered as the 'real' school – the one made up of 'real' books, walls, thoughts', etc. Thus, their theory of action amounts to inoperative action: criticism is only pursued for permanent deconstruction. A second position is that of the 'aligned'. This is the technoeuphoric – and, at times, technocratic – position of those who delegitimise what

exists because something else was invented. Lastly, the position of the 'bottom-up activists' is identified. The emergency has led to mobilisations by headmasters, teachers, schools and universities towards damage limitation or transformation of the educational model. In this case, the theory of action is "pragmatic: you look for solutions at hand, you make mistakes, you discover new devices, you learn by doing, adapting to the technical opportunities that are available" (ibid.).

A further player in the debate is the heterogeneous Italian *homeschooler*[3] population, who chooses not to participate in the institutional schooling (Di Motoli, 2019; Giovanelli & Piromalli, 2019, 2020). The MIUR surveyed 5.126 students in 'parental education' in A.Y. 2018/2019. This marginal number may not remain so in the months to come. The sense of anguish and fear towards physical proximity that Covid-19 can trigger (Manderson & Levine, 2020), as well as the fragilities that the public Italian schooling might reveal in delivering digital education, may indeed favour the growth[4] of home education after the pandemic. The discourses that the two main Italian associations perform around homeschooling during the Covid-19 phase are different: on the one hand, a vision that aims at promoting the institutionalisation and stabilisation of homeschooling. On the other, a project whose purpose is the marketisation of this practice. In particular, in an Open Letter

3 Homeschooling is "schooling which occurs outside of an institutional school setting, where parents are the primary instructor or supervise instruction" (Vieux, 2014, p. 556). Homeschooling is legally allowed in Italy, under the name "parental education" (*istruzione parentale*). Note that 'homeschooling' cannot be considered the same as 'home-schooling', that is,the adaptation of the *forme scolaire* (Vincent, Lahire, & Thin, 1994) to the spaces and times of social distancing. Homeschooling is in fact characterised by specific theories of action and orders of value (Giovanelli & Piromalli, 2020).

4 The Italian press reports of a growth in the phenomenon of online tutors (*precettori*) during the quarantine (La Repubblica, 2020; Saraceno, 2020). This appears as a process of individualisation of learning as well as the opening of a new market that might share common traits with homeschooling.

to Society, LAIF – L'Associazione Istruzione Famigliare calls for greater recognition of homeschooling within institutions. In the letter, the defence of homeschooling is expressed together with references to the role of the State, citizenship education, and the function of the Constitution: "Homeschooling must not frighten anyone (…) it can, through a process of osmosis, introduce experiences into the [educational] system and highlight its value in terms of learning and education" (Leali, 2020, translation from Italian by the author). On the other hand, the Edupar/Controscuola project (EduPar, 2020) seemingly prefer to exploit (pandemic) market spaces (Williamson & Hogan, 2020) rather than advocate for the institutional recognition of homeschooling. Edupar is a pay-as-you-go portal offering various types of services: information, events, e-learning, a youth section, networking between families, bootcamps with personal mentors, an e-shop. The representation of institutional online teaching performed by Controscuola/Edupar negatively depicts institutional online teaching. Distance teaching is narrated in several webpages as something "boring", that "often does not meet the needs of our children".

Voices have also been raised also in the world of *academia*. In the most constructive cases, they were collective efforts aimed at reflexivity and change. For example, Silvia Gherardi initiated a collective writing experimentation with six other feminist women academics in order to mend a social texture that had run into a breakdown: "as the damaged texture of normalcy is mended, reflexivity may arise about practices that were previously taken for granted, so that the pandemic may provide an opportunity for discussion of the previous social order and the introduction of change" (Cozza et al., 2020, p. 3). Another collective writing experiment has been undertaken by the journal Educational Philosophy and Theory. It consists of a text written by 34 authors on the theme of *Reimagining the new pedagogical possibilities for universities post-Covid-19*. The project provides a wide array of points of view

that are accompanied by a final reflection: "it is not a matter of what can education do so much as understanding and instituting new models of sociality and social relations based on collective responsibility and action, and the ethics of the other" (Peters et al., 2020, p. 43). A project of 'public sociology of digital schooling' (Grimaldi, Landri, & Taglietti, 2020; Landri, 2020; Landri, Grimaldi, & Taglietti, 2020b; Landri et al., 2020a) takes place in Italy at the LABoratory on Education and Digitalisation (Lab-ED) of Federico II University of Naples and CNR-IRPPS. On the basis of a sociological and critical perspective of digital, the authors

> make a claim for a critical and affirmative public sociology of digital schooling that contributed to the emergence of a counter-problematization of the mode of existence of contemporary school. A key move for us is to create a discursive space for enrolling public institutions, multi-disciplinary expertise and the education profession in a socially emancipative and neo-communitarian project of school reform that included the digital as one transformative educational force among others. (Grimaldi, Landri, et al., 2020)

This is a collaborative process that takes place (also) outside the traditional academic channels, as it is oriented towards "multi-disciplinary collaboration and participatory action research that brings together educational and professional communities with expertise from complementary disciplines in a process of school-making whose standpoint is the care and promotion of the educational" (ivi).

7.2.3 On a wider scale: Global processes

At a broader glance, it seems that Covid-19's entry into the global scene has extracted from the mist some barely visible processes. Hence, tendencies that were at best *in nuce* in contemporary education are now intertwined and active.

Ben Williamson has shown how the contingency of the crisis has accelerated and extended trends in global education concern-

ing marketisation and privatisation (Williamson & Hogan, 2020). These processes have been pervading global and Italian education for several years now, often shaping discourses geared towards the recipes of the Global Education Reform Movement (GERM) agenda and its neoliberal and technocratic afflatus (Sahlberg, 2012). Today, however, the space for edtechs is widening, since education and learning – whether collectively or individually undertaken – will have to be mediated by technology – at least partially and temporarily. New sociomaterialities populate education (Viteritti, 2020): individual desks, sim cards, apps for booking seats for classroom teaching, tablets, microphones, headphones, software for videoconferencing, platforms for learning and teaching, pets wandering in front of webcams and walking on keyboards, noises of tableware from the room next door, technological breakdowns, commercial agreements between public and private, etc. The technocultural and socioeconomic processes of platformisation are becoming stronger and more disruptive in their social effects (Van Dijck, Poell & De Waal, 2018; § 1.4).

These processes of marketisation are multi-actor. On the one hand, large transnational policy networks make technoeuphoric visions of education operational. In its policy response titled *Learning remotely when schools close*, the OECD states that:

> The opportunities digital technologies offer go well beyond a stop-gap solution during the crisis. Digital technology allows us to find entirely new answers to what people learn, how people learn, where people learn and when they learn. Technology can enable teachers and students to access specialised materials well beyond textbooks, in multiple formats and in ways that can bridge time and space. Alongside great teachers, intelligent online learning systems do not only teach us science; they can simultaneously observe how we study, how we learn science, the kind of tasks and thinking that interest us, and the kind of problems we find boring or difficult. The systems can then adapt the learning experience to suit our personal learning style with far greater granularity and precision

> than any traditional classroom setting possibly can. Similarly, virtual laboratories give us the opportunity to design, conduct and learn from experiments, rather than just learning about them. (OECD, 2020, p. 1)

Other players in this "great online learning experiment" (Zimmerman, 2020) include "pandemic markets" (Williamson & Hogan, 2020). These are all the big edu-businesses and edtechs that have long been preparing for the reconfiguration of remote education. Ben Williamson and Anna Hogan report, for example, on how the Pearson multinational (and multi-billionaire) company is developing a platform and on-demand education service to the detriment of textbooks – a 'Netflix of education'. Many other actors have been mapped that play a role in commercialisation and privatisation in/of education in the context of Covid-19: government-commercial partnerships, commercial coalitions, intermediaries (philanthropy, think tanks, edtech impact and evidence intermediaries), edtech market-makers, big tech companies enrolling schools, the edu-business sector (ivi).

Another phenomenon – possibly among the least visible – that has been accelerated by the pandemic is the datafication (Lupton, 2014; Pellegrino, Söderberg, & Milan, 2019) of the social and everyday lives of those who are forced to participate in online education: students, professors, administrative staff (Williamson, 2020a). In pandemic markets, edtechs specialise in analytics and metrics of student behaviour according to an evidence-based epistemology of learning. This is also the case of large transnational organisations which embrace the GERM technoeuphoria. It is worth reiterating part of the previous quote by the transnational OECD policy network:

> [i]ntelligent online learning systems do not only teach us science; they can simultaneously observe how we study, how we learn science, the kind of tasks and thinking that interest us, and the kind of problems we find boring or difficult. The systems can then adapt the learning experience to suit our per-

> sonal learning style with far greater granularity and precision than any traditional classroom setting possibly can. (OECD, 2020, p. 1)

7.3 A LOCAL CASE: Communication and discourses by 'Sapienza'

The Covid-19 emergency was a disruptive event at Sapienza, which never invested significantly in elaborating digitalisation policies, practices, and cultures (§ 7). As already mentioned in chapter 6, Sapienza responded differently in the various phases of the emergency.

During the first phase of the crisis, the institutional response aimed at cushioning the impact of the crisis with the available means. Given the urgency and possibly the scarce preparedness of Sapienza with regards to digitalisation, institutional communication appeared initially rather disorganised and inconsistent (Giancola & Piromalli, 2020). Many different notices and warnings were addressed to the staff, which gave rise to conflicting opinions:

> Starting from the day of the communication [about the suspension of lessons], everything was in a total mess. Sapienza has been very confused, almost pathetic in giving information (…) It is completely ignoring the fact that half of the students have difficulties using tools like Meet because they need stable connections. (…) In my opinion, the institution is being really lousy, despite all its statements. (Professor diary B, Faculty of Social Science and Economics)

At that stage, institutional communication was dominated by rational-bureaucratic and technical-assertive linguistic codes. From a crossroads of social and political issues and tense affective atmospheres (Reckwitz, 2016; Mulcahy, 2019), the matter of Covid-19 emergency turned into a system of labyrinthine rectoral decrees, verbose and sometimes pedantic technical instructions, and procedures designed around accountability (Fig. 25).

With the end of 'phase 1', the 'black box' progressively closed. In 'phase 2', the institutional interpretation gradually stabilised.

SAPIENZA
UNIVERSITÀ DI ROMA

Modalità per l'erogazione di didattica a distanza

L'erogazione della didattica a distanza, secondo le modalità operative di seguito dettagliate, è ritenuta valida ai fini della rendicontazione della didattica frontale. Le modalità di rendicontazione saranno successivamente dettagliate.

In questa fase di emergenza, l'erogazione della didattica a distanza di articola in tre fasi:

Fase 1 - Attivazione dell'ambiente di lavoro docente-studenti (classe virtuale)

Il docente attiva l'ambiente di lavoro docente-studenti relativo all'insegnamento da erogare in modalità a distanza (classe virtuale), utilizzando gli strumenti informatici messi a disposizione dall'Ateneo (es. Google Classroom, Moodle: gli approfondimenti sono al seguente link: https://www.uniroma1.it/it/pagina/tecnologie-di-facile-utilizzo-supporto-della-didattica-distanza) o altri strumenti di tipo free-share per gli studenti Sapienza.

COME

- **Preparazione della seduta - STUDENTE:**
  - Al fine di garantire la **privacy** dello studente, è suggerito che lo studente nella «videoconferenza pubblica» compaia inquadrato con le spalle al muro
  - Al fine di garantire il massimo livello di **regolarità** della prova, è suggerito l'uso di due dispositivi (es.: PC e smartphone), il primo connesso nella meet pubblica per lo svolgimento dell'esame, il secondo connesso alla meet riservata per la visualizzazione dell'ambiente circostante
  - Al fine di garantire il **controllo** delle attività svolte nel dispositivo sul quale si svolge l'esame (es.: PC), è necessario che lo studente condivida il suo desktop a schermo intero

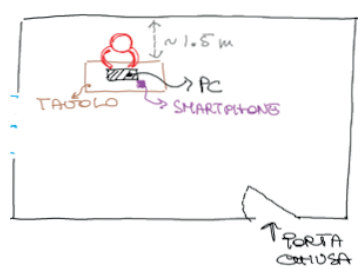

Figure 25. Procedures put in place in Sapienza during the 'phase 1' of the Covid-19 pandemic (source: screenshot by the author; last access: November 2020)

Sapienza provided almost daily indications, standards and prescriptions on teaching, exams, commissions. There was also room for faster and user-friendlier communication through videos and posters (Fig. 26), which replaced the long list of PDFs in the 'Sapienza' page dedicated to the emergency.

Figure 26. Procedures put in place in Sapienza during the 'phase 1' of the Covid-19 pandemic (source: screenshot by the author; last access: November 2020)

It is not yet possible to proceed with in-depth analyses of the 'phase 3' of the Covid-19 emergency. However, some preliminary considerations can be proposed on the discourses that Sapienza performed with its institutional communication. On 1 September 2020, the Sapienza staff received an e-mail referring to three new standards:

1. **Workplaces and spaces Sapienza**: C007-20 - Phase 3 - Prevention and Protection Measures for the resumption

of classroom activities, rev 00 of 08.08.2020 (Prot. N. 58990 feel 01.09.2020), replacing circulars C003 and C004
2. **Classroom teaching**: Phase 3 - Vademecum on prevention and protection measures for classroom teaching, C008-20 rev 00 of 85.08.2020 (Prot. No. 58990 feel 01.09.2020)
3. **Exams, Traineeships, Workshops and Libraries**: Vademecum on prevention and protection measures for the activities referred to in DPCM of 26/04/2020, C005/20 rev 01 of 27.07.2020 - Prot n. 56049 of 06/08/2020. [bold in the original text]

The three documents concern the prevention and protection measures of Sapienza as well as the management of suspicious cases. They add up to 68 pages that are conceived and written in the 'new Latin' of 'managerialese' (Fig. 27) that has been infiltrating the Italian public administration for at least two decades (Gherardi & Jacobsson, 2000).

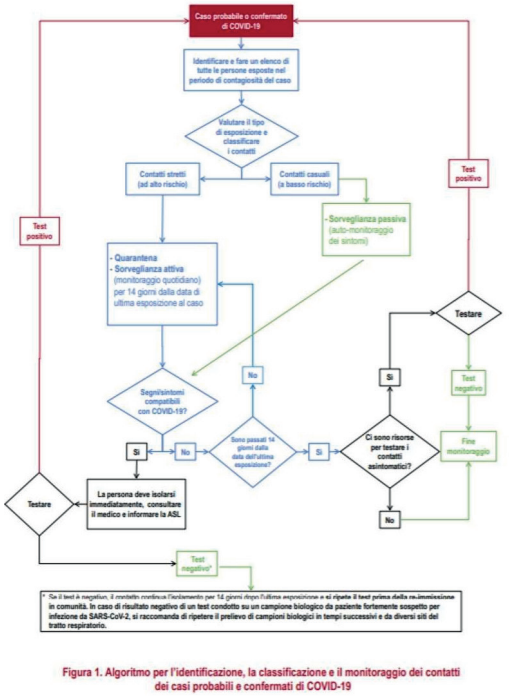

Figure 27.
"Algorithm for the identification, classification, and contact monitoring of probable and confirmed cases of Covid-19" provided in one of the vademecum sent to the Sapienza staff on 1 September 2020.

Figura 1. Algoritmo per l'identificazione, la classificazione e il monitoraggio dei contatti dei casi probabili e confermati di COVID-19

7.4 PRACTISING ONLINE TEACHING IN HIGHER EDUCATION DURING PANDEMIC TIMES

With the emergence of the Covid-19 crisis, the poorly digitalised Italian academia has been forced to a sudden transformation. Exogeneous and urgent events challenged both the *habitus* internalised for centuries by professors that sanctioned and reproduced the sacredness of the academic profession, and the innovative student-centred teaching initiatives that were growing as bottom-up instances (Hoidn, 2016;Viteritti & Pompili, 2020).

In the empirical field that I observed, this transition was complex. Since the first Sapienza Rectoral Decree on the emergency (§ 7.4), a rich nexus of practices has expanded in the professors' community of practitioners. Several organisational, teaching and informal activities – mostly scarcely visible, leading in different directions, and with heterogeneous outcomes – have confirmed the intricacies of this phase.

7.4.1 Organisation and 'shadow' practices

In their stories, professors reflect on what (and how much) is behind the online teaching they have been providing in times of emergency. The sudden transition demanded an 'extra' toil that added up to the tiresome job they were already carrying out. In order to perform online teaching and transpose educational contents from 'chalk and blackboard'[5] to screens, professors had to enact practices of work arrangement and knowledge translation: learning how to use technological tools, preparing *ad hoc* slides for online teaching (which are often more detailed), answering many more emails, learning how to behave in front of a camera (which is often more of an intimate experience than standing before a raised desk in the classroom), etc.:

5 In this sense, it could be interesting for further research to explore the diverse translation practices from offline to online teaching among different disciplinary communities.

> Actually, [students] write much more frequently [now], so I get a lot of emails. (…) our involvement with students is much higher compared to the normal schedule. (Professor diary C, Faculty of Social Science and Economics)

For instance, this is also the case of the 'simulations' between professors and students – and among professors. The aim of these experimentations is to test digital platforms in advance and become familiar with them. These micro-practices seek to anticipate and eschew unexpected contingencies:

> I have arranged for tomorrow a presentation with the students (…) Being them the presenters, on Google Meet (…) to test with them how to share files, to see if everything runs smoothly, if they can move around the meeting. (Professor diary C, Faculty of Social Science and Economics)

> I set up with three colleagues a mini-group in which we simulated this [distance teaching] situation between us. For example, I was very anxious (…) to click on the camera icon and see what would happen. (Professor, Faculty of Political Sciences)

This organisational work is knotted together as a collective endeavour. The consultants narrate about networks that emerge and support the new practices. Some are created from above or pre-existed around positions of institutional responsibility:

> Being the coordinator, I had a bit of a linking role in the transmission of information (…) in the first two or three weeks there was a bit of a black-out. So, whoever had this role of coordinator, found herself to be the transmission belt for information. (Professor, Faculty of Political, Economic and Social Sciences)

> There was a strong work of support that s/he did – at the request of the director – to help many professors who were not familiar with these tools. (Professor, Faculty of Social Science and Economics, C)

Throughout the emergency, additional organisational practices have arisen around further logics. For example, self-help networks have gathered from below around professors who were experienced in operating platforms:

> It took a little more time for someone [to become familiar with the platforms]. It caused changes in the relationships between us. In some cases, it created this sort of 'self-help group' (Professor, Faculty of Social Science and Economics, C).

In any case, the invisible (Star & Strauss, 1999), supplementary, unrewarded and unpaid 'shadow work' has emerged through online teaching that is sometimes delegated to vulnerable and untenured academic staff. Online work, being remote work, is also always on the verge of overstepping the boundaries between working and private life:

> [The pandemic] has multiplied meetings and appointments, without interruption. That has been the most devastating aspect. I can show you the screenshot of this morning's Calendar. I got one task right after the previous one. This is something that would be absolutely impossible face-to-face. Instead, this [the online mode] allows you to be always present, and I don't think that's good. (Professor, Faculty of Social Science and Economics, C)

> During the only week we had been given to set everything up for online teaching, the students were in a panic; they stormed me with emails, often asking questions that I had already answered in previous emails addressed to the whole course (…) In the meanwhile, Sapienza's administration was sending everyday one or more new e-mails, each one updating or even contradicting the technical procedures for online teaching they had indicated in the previous one. I got to the point, after a week of incessant overtime work to meet the standards they had set and that now they were changing day by day, of deleting those emails without even reading them. In the meantime, the professor for whom I had been organising the technical part of the course did absolutely nothing: "I am old, I

> don't know these things, you are young and you are good with computers". I am beginning to understand that this online teaching thing, in the feudal and archaic context of the Italian university, is a huge rip-off for untenured young academics. (Postdoc diary, Faculty of Literature and Philosophy)

7.4.2 Teaching in practice: Improvising between frontality and innovation

'Shadow' organising practices lead to teaching practices that have become visible in the empirical field with different tones. In some cases, online teaching was a mere transposition of transmissive teaching models into the new digital medium. Professors thus chose for asynchronous and *lecture-style teaching*:

> For example, I did not use Meet (…) I found myself a little disoriented (…) I was not very familiar with some of these platforms. So, I decided – I thought it would have been easier – to teach through PowerPoint slides with audio comments, and then provide the mp4 files to the students. (Professor, Faculty of Pharmacy and Medicine)

Sometimes, asynchronous teaching is defended on an epistemological level as the 'true' e-learning:

> It is much better to make a short video, put it on YouTube, and link it (…). The problem is that many professors and administrators have the model of frontal teaching in mind and think that e-learning is the internet transposition of frontal teaching. This is not the case. E-learning is something completely different. It is essentially asynchronous, because everyone must be able to use it at the best time for her (…) But the head of the professor opening and closing his mouth does not add information – rather, it makes internet connections slower. (Professor, Faculty of Psychology)

In most cases, however, professors have carried out reflexivity efforts on their academic practice (Schön, 1983). This involves (re) inventing their own teaching practices and translating them from

the offline to the online world, while keeping a student-centred orientation. Several professors, for example, prefer to send course materials to students before the lesson, so that they could consult them. Thereby, lessons become student-oriented and active debates wherein the professor takes the role of a facilitator (§ 1.1.1). These are the principles of *flipped learning* (Hoidn, 2016); in the field, though, practices more often occurred as ordinary innovation (Landri, 2000) with practitioners sometimes unaware of the theoretical principles behind their doing (Gherardi, 2012):

> The students had audio material and slides before the lesson (…) I was teaching the same lesson on the synchronous medium in any case: I kept on explaining or I went back to things that I think are more complex to understand. Then there was room for discussion or their questions. (…) This 'double mode' required a lot of work (…) so the experience was tiring. I hope it was useful for the students. (Professor, Faculty of Political, Economic and Social Sciences)

> My teaching logic is somewhat 'flipped classroom'. First, you study at home the material I'm going to explain (…) anything that is not clear to you or that poses problems, curiosities or questions – you have to bring it into the classroom. (…) There is this aspect of the flipped classroom, i.e. to invert the sequence: first you study alone with your 'weapons', your skills and your luggage, and then, in the light of that, I will guide you to the lesson. (Professor, Faculty of Social Science and Economics, D)

Moreover, the transition to distance learning has not slowed down the *inquiry-based and cooperative teaching* that many consultants, especially in the social and political sciences, were already pursuing. Rather, the crisis has challenged the professors to translate into the digital space the practice of igniting group research. The cooperation between students takes place in the sociomateriality of several Google Meet or Microsoft Teams rooms, where professors go back and forth to coach groupwork:

> I told them: "Here you can interact as you want, because this is your channel and you can hold meetings, share files and do whatever you want". This worked excellently. I may say that group work no longer makes sense in the classroom. Group work should be done on Microsoft Teams, in the future, with classroom teaching. That's my point of view. (Professor, Faculty of Political Sciences)

In one empirical case, cooperative teaching has taken place within an *informal and multidisciplinary collaboration among professors*. Thereby, the curriculum moves towards integration (Bernstein, 1971) through bottom-up practices, and theory is assembled with practice:

> I had a very theoretical course, while he had a very practical one in which he should have taught how to do empirical research (…). So we said: "Let's join: I'll provide you with some themes – in your course, it is not important what the research is about, but how to do it" (…) we did a real research (…) We collected the questionnaires, we made the data matrix. (Professor, Faculty of Social Science and Economics, D)

Sometimes, I could observe the *enrolment of external actors* in university courses. In some cases, the logic of student-centred teaching was seemingly oriented towards employability as well. Such practices were expected to increase the engagement of students, which was deemed more necessary in online teaching than in classroom teaching:

> Students, other professors and stakeholders: in my teaching, all three actors are actively involved. (…) Can all this be carried out at a distance? Of course it can. It can be without any problems (…) Distance teaching needs activities that directly involve students – perhaps even more than classroom teaching. (Professor, Faculty of Communication Science)

Finally, among the asynchronous content offered in online teaching, the *'pill' format* is worth mentioning. In this video format, professors record very short and carefully designed contents.

This educational form seems to be gaining popularity, despite some criticisms:

> In my future – I haven't done this yet, but that is the goal for my next activities – I will organise some pills that I will publish on Classroom, so that the students can listen to the lesson first, and then discuss it. (Professor, Faculty of Communication Science)

> The first stage was the 'pill' to replace the lesson (…). I recorded some lessons, uploaded them to YouTube and then I upload the links. (…) And I told them: "Obviously, I absolutely forbid you to have a continuous session of one hour and fifty. Even if it takes time, study ten minutes, then stop, and resume either after half an hour or the next day. Just focus on two slides at a time". (Professor, Faculty of Social Science and Economics, D)

> I find it a bit terrifying that we are beginning to propose and spread sociology pills, statistical pills, economics pills, law pills – pills, pills, pills (…) Well, I am afraid of what this 'pillolisation' of university knowledge could produce from the point of view of teaching. Personally, I do not consider it positive. (Professor, Faculty of Social Science and Economics, C)

In general, distance teaching does not appear yet as a crystallised knowledge preceding action, neither as an internalised professional *habitus*, nor as a 'new normal'. Rather, the sudden transition has represented an unexpected interference for higher education professionals in Italy, who have mostly dealt with it as an ongoing process of improvisation and formativeness (Gherardi, 2016). The ways of performing online teaching are thus ongoingly (re)invented as the very object of the practice takes shape:

> It was a daily adaptation to the evolution of needs that were not even explicitly communicated to me. I grasped that what I was doing might not be enough, or alienating, or too much. So, I always kept adding or modifying little pieces. (Professor, Faculty of Social Science and Economics, D)

7.4.3 Informal practices and everyday life

The emergency has seemingly brought forward both crises and the mobilisation of new individual and organisational resources and experiences. This also emerges in informal practices that become visible within and around teaching. They seem to give meaning to the professors' everyday life:

> I would show myself at the beginning [of the lesson], say goodbye, close the webcam and leave. At the undergraduate course they would ask me to keep it on: "This way, we focus more!". With the master course, there wasn't this problem. They were satisfied anyway, just to listen to me. (Professor, Faculty of Political Sciences)

> It is the first seminar lesson, and the first distance learning lesson. In the end, we say goodbye opening all the microphones and webcams. The final effect is very nice. (Postdoc diary, Faculty of Literature and Philosophy)

In this sense, teaching sometimes holds the everyday lives of professors together – and students as well, as shown with the transition to digital at the University Federico II of Naples (Consiglio et al., 2020). It mitigates subjective crises:

> Teaching has kept alive the sense – not of 'duty', but of everyday life and work; especially thanks to this extra work. It has been a kind of 'rope', a difficult thread to break. It has made the lockdown period a little more familiar and less absurd, less 'science fiction'. (Professor, Faculty of Social Science and Economics, D)

Some professors have seemingly exerted a "negative capacity" (Lanzara, 1993) as an ability to 'stay' in uncertainty and grasp the potential that such social experiences may provide. It is about welcoming indeterminacy and bewilderment, and repositioning habitual routines in new contexts:

At the end of the undergraduate course, I was asked to have an aperitif – a virtual toast. (…) I assure you: this seems a banality, but it was a very strong experience. And it came from them [the students]. (…) Then, in the other [course], I proposed it myself. I think that maybe they hadn't thought about it; but not because they didn't like it: in fact they were immediately enthusiastic in saying: "Yes, absolutely!" (Professor, Faculty of Political Sciences)

7.5 PRAGMATIC REGIMES OF ENGAGEMENT WITH DIGITAL PLATFORMS

The practices that I have described did not take place in a vacuum, but within complex relationships with the materialities that co-produced them. To observe the ways through which the professors relate with the digital sociomaterial world of higher education (Gherardi & Perrotta, 2016), I examined their pragmatic regimes of engagement[6] (Thévenot, 2001) with digital platforms. I could thus distinguish and articulate the three regimes of engagement proposed by Laurent Thévenot (ivi): personal famili-

6 Influenced by the practice-based approach (Schatzki, Knorr-Cetina, & Savigny, 2001), and in search for alternatives to the excessive structuralism of mainstream sociology, French pragmatic sociology aims at understanding how individuals coordinate their lives and perform 'justification work' (Thévenot & Boltanski, 1989) when they criticise or justify orders of worth in their everyday lives. Laurent Thévenot developed the concept of 'pragmatic regimes of engagement' to describe "social devices which govern our way of engaging with our environment inasmuch as they articulate two notions: a) an orientation towards some kind of good; b) a mode of access to reality" (Thévenot, 2001, p. 14). The regimes of engagement are intended, therefore, both as active coordination or accommodation with the (material) environment, and as delineation of a good and quest for it (Thévenot, 2009). This epistemological posture provides for the tension within the same entities (human or non-human) of competing engagement, rationalities, orders of value. The concept of 'engagement' has diverse applications among epistemic communities, e.g. management engagement (Bakker & Schaufeli, 2015), student engagement (Christenson, Reschly, & Wylie, 2012), as well as various nuances in the field of STS (Lupton, 2016; Zampino, 2019).

arity, individual plan, public justification for the common good. Competing rationalities and orders of worth therefore coexist and clash within the same subjects and organisations as 'compromising machines'.

7.5.1 Feeling at ease: Intimacy with technology

Technological sociomaterial environments were sometimes experienced as usual, used and comfortable spaces. The personal habituation to education technology seems to "rest on an accustomed dependency with a neighbourhood of things and people" (Thévenot, 2001, p. 16). Humans and non-humans are entangled: things are worn out and personalised – and personalities are attached and consolidated to things. In engagements of personal familiarity (Thévenot, 2019) with educational technologies, the sought good is a personalised 'feeling at ease':

> This is an environment where, if I had to go back, I would feel perfectly at ease. Since the indication of Sapienza is to use Meet and Moodle, I will leave Teams –after shedding some tears – and move on to those. (Professor, Faculty of Civil and Industrial Engineering)

In some cases, an informal component has emerged within the experience of online teaching that is related to the familiar enjoyment of the surroundings in which the practice takes place (ivi). People remained attached to things (Gomart & Hennion, 1999): there is a special relationship with appropriated objects that are perceived in terms of relationships rather than as instrumental. In the following excerpt, the 'integratedness' of the digital educational environment apparently leads to a special relationship with that setting and the sense of comfort and easiness it evokes:

> It's nicer to do it [teaching] in an integrated environment. (…) Eventually, one gets attached to that environment: the fact that we have the lessons recorded, and the blackboard is saved in a special space… I don't know how to say it. Having spent so

> many hours there… Before [with classroom teaching], in the end, a course was finished and there was a blackboard that would be erased. But now there is one thing that contains all the recordings, all the chats with the students, the students' work, what has been written on the blackboard of all the lessons… (Professor, Faculty of Civil and Industrial Engineering)

Some consultants are at ease in expressing their emotions about technological feelings and showing themselves in their intimacy. Sometimes, they tell about positive experiences:

> For me, it was a (…) beautiful experience (…) an unforgettable experience from all points of view, from the human point of view too (…) the relationships and emotional bond created with these people, who know much more about me than I have in my years of classroom teaching… (…) I wanted to see them, to really look them in the eye. (Professor, Faculty of Political Sciences)

Other times, however, the emergency has led to personal crises:

> That which was taken for granted – how important it really is, in meetings, chats, to work face-to-face with other colleagues, office hours for students, by appointment or not… This world is practically lost. Not in the sense that we will never get it back – who knows? – but lost in the sense that it is an irreplaceable absence, an absence without solution: the university, understood as 'place', is as if it had been eliminated. So, I have taken it worse and worse – even if it was clear from the beginning that this situation would have lasted for long… at first you get used to it – there is also a bit of novelty. You think that maybe it could be solved with a twist in a short time. Then time passes and it becomes a heavy absence. I don't know if I am answering your question, as I am speaking about issues of intimate psychology. I don't know if you wanted to know this. (Professor, Faculty of Social Science and Economics, D)

In all these cases, the sociomateriality of the world of education and learning is engaged as something personal and intimate.

7.5.2 To just do: Technologies as tools

> So, in my opinion, that principle from which I started – 'user-friendly' – is crucial for all platforms. The more immediate a platform is and the more it facilitates work rather than complicating it – the more effective that platform is. I always use a trivial example with students. I compare technological platforms to kitchen tools: a fork and a knife. They are immediate to use because you are accustomed to using them since childhood; but the more immediate they are, the simpler and easier they are to use and thus they become a support for their users. (Professor, Faculty of Communication Science)

As shown by this extract, educational technologies are also engaged as tools for the realisation of individual plans (Thévenot, 2009). It is the satisfaction generated by a plan that constructs the 'good' that is sought after. Such satisfaction refers to the autonomy of a self which is endowed with intentionality that is committed to the completion of a project (ivi).

Hence, technologies are experienced not only as objects of use within a comfortable and 'warm' reality. They are also framed as technical and neutral objects, stripped of any social effects. The register of 'time' was therefore mobilised to perform evaluation work. The discourses spin around the themes of effectiveness and user-friendliness:

> I must say that, like all the Sapienza platforms, it is not very user-friendly. This is a big limitation. They are complex to use; I mean, it takes a very long time. Every time, you have to waste a lot of time. I hate using them. I use them because I am forced to. I would like them to develop a single system instead of having heaps of them: a single platform, more user-friendly, dynamic, fast, quick – that doesn't make me waste entire days every time I have to enter data. (Professor, Faculty of Communication Science)

Emotions leave room to neutral evaluation:

> With this system, only those who complete the modules while we are dealing with them in class can complete the course. This guarantees me that the topics are diluted in three months of teaching, according to the right timing, and that students do not study the whole programme at the end of the course because exams are approaching. From the point of view of learning, this is better: it makes more sense to read a book by dedicating a week to each chapter before moving to the next one. In that week, everything on that chapter is made available on the platform. (Professor, Faculty of Social Sciences and Economics).

> There are a thousand things that I do not like, but not so much concerning its function: simply with respect to its effectiveness. For example, if you are inactive for more than five minutes, you have to log out and then log back in – as well as a thousand other absurdities. However, nothing seriously hinders teaching or the evaluation activity. (Professor, Faculty of Social Sciences and Economics).

7.5.3 Making things right: Technology and injustice

Finally, criteria of generality and legitimacy also come in play to justify the consultants' own practices in the sociomaterialities of education. I could indeed observe several discursive nuances that share a critical orientation grounded on an idea of 'common good' (Thévenot, 2001).

In certain cases, engagement with technologies is guided by a criticism of the values that the platforms are deemed to inscribe. Platforms are sometimes considered as tools constructed for management and accountability rather than educational practices. Those who should be the main users of them – the professors – are *de facto* excluded from their co-design:

> GOMP is the thing that all Sapienza's professors always say is a nightmare, a bureaucratic abyss, the bureaucratisation. When talking about GOMP, it becomes very hard indeed to discuss

> pros and cons. (Professor, Faculty of Civil and Industrial Engineering)

> Sapienza's accountability rules are insanely detailed. (…) I have the feeling that in the preparation and customisation of computer platforms, professors – who are the users of many of them – are not consulted (…) Professors are always seen as the ones who use them [the platforms] – but then someone else makes the rules. (Professor, Faculty of Civil and Industrial Engineering)

Further evaluations are based on considerations regarding the effects of the platforms. They somehow elude the control of humans by arranging practices beyond their control:

> I experience GOMP in a conflictual way because it seems to me a bit like the *dominus* that governs the architecture of the educational offer and limits possibilities for innovation. (Professor, Faculty of Social Science and Economics, C)

> Sometimes, we find ourselves having to adapt to the potentialities of a [digital] tool rather than to our own needs. (…) why, if I try to experiment with solutions that solve certain problems affecting the evaluation of the degree programme, can't I do that? Just because the tool doesn't allow it? It's pure madness. I cannot be a slave to a technological instrument, the technological instrument must help me. (Professor, Faculty of Communication Science)

> Since it is rigid and structured in a certain way, the rules tend to be aligned with the IT platform, and not vice versa. What the IT platform does not allow to do – because it was not developed in the most appropriate way, or the development stopped at a certain point – then that becomes the rule, because it is not possible to do otherwise. So that too has been a source of criticism and considerable stress over the years. (Professor, Faculty of Civil and Industrial Engineering)

In other cases, rather than to the platforms themselves, criticisms are directed to the inequalities that the platformisation

processes accelerate and highlight. For example, distance teaching practices are believed to exacerbate power inequalities that are already existing in the Italian academic culture:

> It's a Sisyphus' work, all on my shoulders, invisible and unpaid. (…) I wonder how this all is dealt with by the students of professors who are not computer-skilled or who do not have an untenured young researcher to delegate all the "computer stuff" to. For the moment, the grade I give to online teaching (not in itself, but in the context of the power and inequality relations between professors and untenured staff, between these two and the students, and between more and less economically advantaged students in this situation) is 4/10. (Postdoc diary, Faculty of Literature and Philosophy)

Sometimes, a neoliberal matrix for them is identified:

> Then it becomes very evident that there is a 'block' of power going in a certain direction, whose end is not that of sharing knowledge and opening up research and freedom of research. This is very evident in this situation too (…) but those who also see a strongly neoliberal imprint in this process, and a re-acceleration of strong liberal processes – they are frankly right. If I tell you what has become now (…) what it is becoming and what has become working in university… it is something disheartening. (Professor, Faculty of Political Sciences)

Significantly, I could not detect in the professors' narratives any regime of engagement in which technologies were seen as positive agents for the common good. Rather, they were always held negatively against an idea of justice in order to highlight how they diverted from it. This qualitative insight might invite a reflection on a human-centred repositioning of platforms at Sapienza and, broadly, in the Italian academia.

part IV
ecologies

FROM PLATFORMS TO ECOLOGIES

OPENING THE BLACK BOX OF "INTEROPERABILITY"

8

Today, the literature on digital technologies in the social sciences is vast and heterogeneous. New research is published every day with disparate empirical focuses: the relationship between ICTs and student performance, the effects of online platforms on social life, the values inscribed in a mobile app, the governance of a specific infrastructure, etc. This also applies to the field of education, where digital technologies have long been the target of investigation from a variety of disciplines – or assemblages of them – and theoretical approaches.

A common trait stands out when considering such literature from a distance. It is based on an epistemological perspective oriented towards separation, rather than connection (Latour, 1991). Indeed, digital actors are often[1] researched as if they were mutually unconnected and isolated entities on the analytical, spatial, and temporal level. The analysis, therefore, is frequently bound to a single digital object whose interconnectedness is not considered or disregarded.

However, as suggested in ecological philosophy as well as in Science and Technology Studies (§ 1.1.1; § 2.2), social actors – including digital ones – do not act in isolation or solitude, but rather as assemblages of heterogeneous entities, continuously entangling with each other (Law, 2004a). Besides observing them in their sin-

1 By contrast, various strands in the study of education are infused with an ecological epistemology. Some references are mentioned in § 8.5. Among others, see Van Dijck, Poell, & De Waal, 2018; Williamson, 2018; Landri, 2018; Decuypere, 2019; Grimaldi, Lumino, & Gambardella, 2020.

gularities, it is thus possible to observe the connections between them (or the lack thereof). Hence, beyond the single actor, research can focus on the ecology within which these entities converge (Star, Bowker, & Neumann, 2004): "[w]hat can be studied is always a relationship or an infinite regress of relationships. Never a 'thing'" (Bateson, 1979, p. 178). Rather than on the individual trajectories of the actors, investigations can be set on the 'pattern which connects' them:

> We have been trained to think of patterns, with the exception of those of music, as fixed affairs. It is easier and lazier that way but, of course, all nonsense. In truth, the right way to begin to think about the pattern which connects is to think of it as *primarily* (whatever that means) a dance of interacting parts.
> (Bateson, 1979, p. 13, italics on the original text)

Such an ecological vision enables an all-round, reticular and potentially multidisciplinary observation. Many questions emerge therefrom: how do these agents intertwine? What mediates such connection? What happens when this connection does not 'work'? This vision also requires considering the point of view of all entities, rather than giving priority to a single actor (Star, 1995). Hence, research is woven together by observing and practising synchronicity, interdependencies, cooperation, boundaries (Star & Griesemer, 1989).

In the fourth Part of this research (§ 8 and § 9), I shall mobilise this approach to reframe what has been undertaken so far, and experiment an ecological outlook on the digital platforms of Sapienza. I shall therefore attempt to shift the focus from unconnected platforms towards the wider interconnected tangle that they chorally perform, and observe their relationships.

As will be shown, the technical consultants maintain that digital ecologies are 'held together' by the property of *interoperability*. From a technical point of view, interoperability is often considered as a 'connective' capacity of heterogeneous software appli-

cation to 'speak' to each other and work in a coordinated way (see *infra*). Today, interoperability is a highly relevant and pervasive issue. Especially after the accelerated digitalisation fostered by the Covid-19 pandemic, it has become an important player in law and regulation, politics at all scales, and everyday life in all social worlds. Interoperability is indeed everywhere, as it emerges wherever computer and electronic software exchange data. In some cases, it is quite visible; this is the case, for example, of the devices interconnecting via the Bluetooth standard, or apps entwining in cloud spaces. Often, though, interoperability works as an invisible background. Many websites use transparent interoperable layers which send and/or receive data via standard formats such as XML, Java or SQL. The internet of things is more and more present in our homes (Ganzha, Paprzycki, Pawłowski, Szmeja, & Wasielewska, 2017).

This chapter aims at opening the black box of interoperability. The emergence of such idea is described, as well as its journey into space-time, the construction of networks, and the arrangement of social fields around and through it. In particular, by means of archival material and interviews with privileged witnesses, I reconstruct the journey of interoperability (Czarniawska & Joerges, 2011; § 8.1), its stabilisation and representation in computer science (§ 8.2), its regulation and governance at the transnational, international and Italian level (§ 8.3) and, lastly, its political aspects (§ 8.4) and its entrance in the social sciences (§ 8.5).

It shall then be possible to proceed from the analysis of platforms as isolated digital actors to the observation of the connections that mediate their convergence into wider ecologies.

8.1 A BLACK BOX TRAVELLING ACROSS TIME, SPACES, DISCIPLINES: Interoperability from subsidiarity to focality

The concept of interoperability is not recent (Fig. 28). Such

idea was fabricated at least at the beginning of the last century. Patents containing the word 'interoperability' were filed since the early 1900s: a water cleaning filter in Austria (Patent No. AT21476B, 1905), a telephone device in Russia (Patent No. SU10954A1, 1924), and a device for personal hygiene in Switzerland (Patent No. CH136004A, 1929). At that time, interoperability was the object of a subsidiary rather than focal awareness[2] (Polanyi, 1958) inasmuch it was a tool for practising rather than the subject of professional practice. It therefore embodied a practical and tacit knowledge that ignored the principles underlying its very action, i.e. an artisanal *docta ignorantia* (Gherardi, 2012).

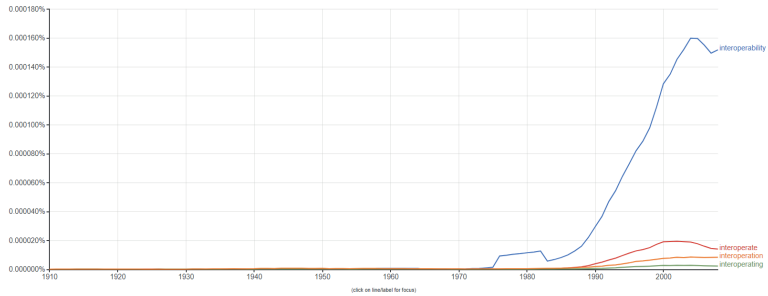

Figure 28. Google Books NGram viewer for "interoperability", "interoperate", "interoperation", "interoperating", from 1910 to 2008.

The Google Ngram Viewer charts the frequencies of any strings printed between 1500 and 2008 in Google's text *corpora*. I used the 'English 2008' dictionary, the largest and most recent one. Hence, as this visualisation is based on books written in English only, it is strongly biased.

2 "When we use a hammer to drive in a nail, we attend to both nail and hammer, but in a different way. We watch the effect of our strokes on the nail and try to wield the hammer so as to hit the nail most effectively. When we bring down the hammer we do not feel that its handle has struck our palm but that its head has struck the nail. Yet in a sense we are certainly alert to the feelings in our palm and the fingers that hold the hammer. (…) The difference may be stated by saying that the latter [the feelings] are not, like the nail, objects of our attention, but instruments of it. They are not watched in themselves; we watch something else while keeping intensely aware of them. I have a subsidiary awareness of the feeling in the palm of my hand which is merged into a focal awareness of my driving the nail" (Polanyi, 1958, p. 55).

The first reflections about interoperability are apparently in the 1970s. In the US military literature (e.g., Cooling & Hixson, 1978; Reindl, 1979) of the time, interoperability was linked in practice to the standardisation of military devices for war and communication (Diedrichsen, 1978): "[t]he concept of interoperability is based upon standardisation of combat vehicles at the subsystem level" (Wolcott, 1978, p. 1). The attempt was therefore both to develop interoperability in practice, and reflect on the concept at a meta-applicative level:

> [s]tandard, accepted (…) NATO definitions of interoperability remain inadequate. The term must encompass virtually every aspect of military operations so as to incorporate the subtleties and innuendoes inherent in any integrated force. (…) The fundamental lesson or moral emerging from World War II experience with value for the future is simply plan, train, organize for allied inter-operability – or have it anyway. (Cooling & Hixson, 1978, p. 2)

In the 1980s, the idea of interoperability extended beyond the military field and impregnated further social spheres. It circulated with special energy among the computer communities that at the time were engaged in imagining and crafting early connective networks among information systems (ISDN, LAN, etc.). In these spatialities (North American and, later, European) and temporalities (from the beginning of the 1980s, to the early 1990s), interoperability truly emerged as an idea "whose time has come" (Czarniawska & Joerges, 1995) through heterogeneous chains of translation that stabilised it and produced narratives. Interoperability was at the core of an imagined "worldwide digital system architecture" (Cannata, 1991; Hall et al., 1989; LaVean & Sonderegger, 1982; Treiber, 1981) and appeared in scientific literature both as a tool for practising and as a meta-concept to be analysed and defined.

In the following decades, interoperability gained further energy by occupying diverse disciplinary and policy fields: it circulated

through technical fields, and then into the sphere of the media and public debate. In the 1990s, the focus was on GIS (Geographic Information System) and security (Johnson et al., 1998; Voisard & Schweppe, 1998). Between 2000 and 2010, in a 'knowledge economy' framework, interoperability was represented as an essential component in business. It became a product to sell – for example, as a component inscribed in software for urban e-government (Kolbe, Gröger, & Plümer, 2005) and healthcare (Patent No. US20080046292A1, 2008) – and a *topos* in brand narratives and information systems (Vernadat, 2007).

In the last decade, more and more reasoning has been taking place at the 'meta' level around interoperability. Interoperability is now expendable in healthcare and medical care (Fig. 28), since health technologies have to be instantly connectable and usable ('plug-and-play') – especially in emergency situations (Bahga & Madisetti, 2013; Jabbar et al., 2017; Mandel, Kreda, Mandl, Kohane, & Ramoni, 2016); uses in the fields of e-government, public safety and military forces are also receiving renewed interest. Furthermore, interoperability is slowly becoming a mainstream theme in education – especially K-12. Interoperability frameworks in education often incorporate euphoric visions of technology in which

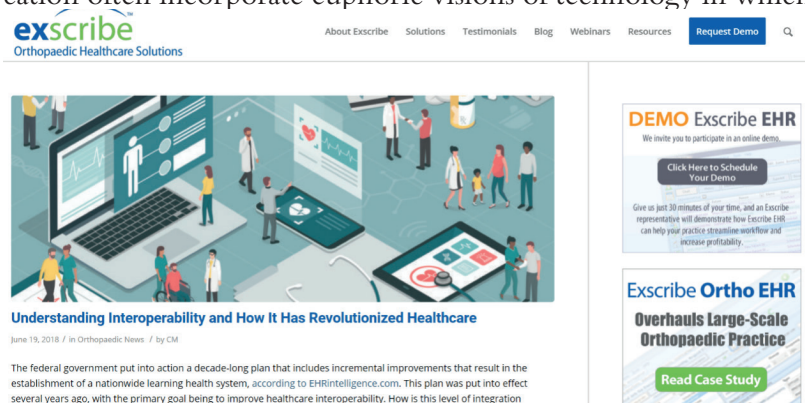

Figure 28. "Understanding interoperability and how it has revolutionized healthcare" (source: screenshot by the author; Exscribe, 2020; last access: November 2020).

interoperability is represented as a tool for the efficiency of data resources and organisation, as well as for the improvement of data-driven and evidence-based education: "Interoperability is not just about improving efficiencies by connecting data systems and reducing manual data entry or improving the consistency of data, it is about connecting different types of data points to present a full picture of student learning" (SETDA, 2018).

The idea of interoperability was therefore transferred for at least a century through markets, disciplines, social spheres – and continuously translated into further quasi-objects (ideas, documents, artefacts, etc.; Latour, 1991). From being an object of subsidiary awareness, it has gradually an object of focal attention (Polanyi, 1958) and professional reflexivity. It has moved to the centre of practices and towards 'meta'-level examination. Apparently, though, this reflexive displacement have only seldom led to the uncovering of its technical black box. Indeed, interoperability mostly remains caught within an extra-social framing. This epistemological stance is very visible in the computer science research on the topic.

8.2 INTEROPERABILITY IN COMPUTER SCIENCE: A matter of fact

Interoperability is studied in many 'hard sciences'; in computer science and engineering in particular. Definitions are proposed by technical standard organisations and in the scientific literature.

The ISO13606[3] standard defines interoperability as "the ability of different systems and organizations to work together seamlessly (…) exchanging information and using the information that has been exchanged" (ISO, 2008). According to the Standard Computer Dictionary by the Institute of Electrical and Electronics

3 ISO 13606 is a standard from the International Standardization Organization (ISO). It was originally designed by the European Committee for Standardization (CEN).

Engineers (IEEE), it is "the ability of two or more systems or components to exchange information and to use the information that has been exchanged" (IEEE, 1991, p. 114). In computer science literature, interoperability is also defined as "a measure of the degree to which different systems (…) are able to work together to achieve a common goal" (Ide & Pustejovsky, 2010, p. 2). These definitions focus on the idea of 'system', the exchange of information, and the effect of coordinated work. 'Internal' interoperability concerns the ability of the components of a system to mutually interact, while 'external' interoperability regards components of third party systems (Elmir, Elmir, & Bounabat, 2015).

For computer systems, interoperability is generally categorised as either 'syntactical' or 'semantical'. Syntactical interoperability occurs when systems can communicate and exchange information through standard data formats and communication protocols[4]; this forms the basis for any other kind of interoperability. Conversely, semantic interoperability is exhibited when two or more systems "automatically interpret the information exchanged meaningfully and accurately in order to produce useful results for end users" (Ide & Pustejovsky, 2010, p. 2). Semantic interoperability is required so that systems can agree on the interpretation to be given to data. Systems must all refer to a common information exchange reference model, that unambiguously interprets the content of the negotiation according to the principle 'what is sent is what is understood' (ivi; ISO, 2008). Currently, the efforts of professionals are focused on ensuring consistent and adherent interpretations (i.e., semantic interoperability) rather than improving data processing without changing the data's physical format. This is because mapping techniques between data formats have already been sufficiently developed, while ensuring consistent interpretations has proved more elusive (Pareja-Lora, Blume, Lust, & Chiarcos, 2020).

4 For example, the XML, SQL and JSON formats provide syntactical interoperability.

In computer science literature, interoperability is often distinguished from other concepts that might overlap. 'Compatibility' broadly concerns the "degree to which a product, system or component can exchange information with other products, systems or components, or perform its required functions, while sharing the same hardware or software environment" (IEEE, 1991, p. 45; see also ISO, 2017). According to some authors (e.g., Kosanke, 2006), a continuum runs from incompatibility (two or more devices are not able to work together in the same application) to co-existence (they can operate independently from each other in the same communication network), to interoperability, up to interchangeability (they can replace each other in working together in one or more applications). In the IEEE Dictionary, "integration" is defined as "[t]he process of combining software components, hardware components, or both into an overall system" (1991, p. 112). Hence, while interoperability concerns relationships and exchange among data, integration is more about merging and harmonising data. The analytical stance changes between the two: in the case of interoperability, the focus is on the ecosystem and its movement; in the case of integration, it is on integrated output.

Different types of standards are used that mediate interoperability and make it possible: formats (e.g., CERIF; § 9.1), procedures (e.g., APIs), protocols (e.g., OAI-PMH), etc. For instance, standards might work as an intermediate layer that 'translates' data from heterogeneous languages to a common language, or as a common 'access point' for heterogeneous software. The latter is the case with APIs (Application Programming Interfaces), i.e. packages of procedures that a piece of software 'exposes' (i.e., makes available and accessible) to the outside so that other software applications can use some of its functionalities (Plantin et al., 2018; Vis, 2013).

Computer software literature has studied interoperability in depth. However, this topic is confined to a purely technical dimension within this field. Interoperability is monumentalised as a 'matter of fact' – an extra-social and neutral property, which al-

lows systems to function, but does not truly effect social lives. The same does not apply, however, to the governance work of interoperability, whose richness and complexity shows the infiltration of this theme into social worlds, lives, and organisations.

8.3 GOVERNING INTEROPERABILITY: Policy and organisations

As mentioned, interoperability has been an issue in policy-making at the transnational, international, and local level for at least twenty years. It is governed by organisations dealing with its standardisation, definition, and maintenance, as well as organisations that define standards for its enactment.

Several transnational and local organisations promote the standardisation and advocate for interoperability. The European Union, for example, is committed to this issue. The Interoperable Delivery of European eGovernment Services to Public Administrations, Businesses and Citizens (IDABC) was a European programme (2004-2009) that promoted the development of digital platforms for public e-services in Europe; it also developed the first version of the European Interoperability Framework. At its end, the IDABC was replaced by the Interoperability Solutions for European Public Administrations (ISA) and ISA^2 (2016-2020) programmes. ISA^2 aims at supporting the development of digital solutions that enable public administrations, business, and European citizens to take advantage of interoperable public services across borders and sectors. Such programme has launched a revised European Interoperability Framework (EIF); a revised European Interoperability Strategy (EIS); the European Interoperability Reference Architecture (EIRA); the European Interoperability Cartography (EIC). Among the non-EU organisations, the European Committee for Interoperable Systems (ECIS) is a non-profit association founded in 1989 and aimed at promoting interoperability and market conditions in the ICT sector, as well

as vigorous competition on the merits and diversity of consumer choice (§ 8.4). The Network Centric Operations Industry Consortium seeks to facilitate cross-domain interoperability at a global level across borders, language and technical barriers. Formed in 2004, it stands today as an extensive policy network of more than 50 members from business, government organisations and academic institutions in 12 countries.

The role of Standards Developing Organisations (SDOs) active on interoperability issues is also relevant. In general, SDOs devote themselves to the development, coordination, promulgation, revision, and interpretation of standards. Among these, the Organization for the Advancement of Structured Information Standards (OASIS) is a global non-profit consortium that works on the development, convergence, and adoption of open standards (e.g., energy, emergency management, security, internet of things, content technologies, etc.). BuildingSMART (formerly, the International Alliance for Interoperability) also has an international resonance and aims at improving the exchange of information among software applications used in the construction industry. Furthermore, concerning user communities, Neutral Third Party creates standards for interoperability among business processes. Another example of a SDO user community is the Internet Engineering Task Force (IETF) which creates RCF documents (Requests for Comments), i.e. *memoranda* that could become new standards.

In transnational and national policies, the concept of interoperability is mainly framed within the eGovernment Interoperability Framework (e-GIFs), where technical aspects are accompanied by organisational elements (Yu, Mockus, & Delaurentis, 2016). In the European context, the framework of reference is the abovementioned New European Interoperability Framework (EIF) of ISA[2]. It is part of the *European Interoperability Framework – Implementation Strategy* (COM(2017)134) adopted by the European Commission on 23 March 2017. In the EIF, the issue of interoperability is linked to the public sector and represented as a tool to fulfil one of the

'priorities' of the Juncker Presidency of the European Commission, i.e. to remove barriers to a digital single market in Europe. In such a market, the public sector "plays a key role as a regulator, service provider and employer". At present, "digital fragmentation" hinders the integration between intra- and cross-border public services. Through interoperability, public administrations can "save time, reduce costs, increase transparency, and improve the quality of services" (European Commission, 2017b). Interoperability is considered as

> a key factor in making a digital transformation possible. It allows administrative entities to electronically exchange, amongst themselves and with citizens and businesses, meaningful information in ways that are understood by all parties. It addresses all layers that impact the delivery of digital public services in the EU, including: legal issues (…); organizational issues (…); data/semantic concerns (…); technical challenges (…). (European Commission, 2017a, p. 3)

This Communication by the European Commission is followed by an "interoperability action plan" articulated in five strategic focus areas: to ensure governance, coordination and sharing of interoperability initiatives; to develop organisational interoperability solutions; to engage stakeholders and raise awareness on interoperability; to develop, maintain and promote key interoperability enablers; to develop, maintain and promote instruments that support interoperability.

With regard to the Italian case, the first occurrences of the idea of interoperability in the policy sphere are in the early 2000s (Aliprandi, 2014). On 19 December 2003, the Directive *Development and use of computer programs by public administrations* (also known as the 'Stanca Directive') was issued. Its purpose was to provide public administrations with indications and criteria to manage the processes of software acquisition or preparation. The 'Stanca Directive' introduced interoperability in the Italian law and provided its first definition, as "the ability of information sys-

tems (even heterogeneous) to share, exchange and use the same data and interface functions" (art. 2; translation by the author). Interoperability was considered as a criterion for the choice of programs in public administrations (art. 4). In 2003, the National Centre for Information Technology in Public Administration (CNIPA) was established to replace the Authority for Information Technology in Public Administration (AIPA), whose functions it retained. The following step was in 2005, when Legislative Decree 82/2005 'Digital Administration Code' (CAD) was issued in which the 'Stanca Directive' was almost entirely transposed. Such text aimed at reorganising various fragmentary sources on information technology and e-government. Interoperability is mentioned in Article 68, paragraph 2:

> Public administrations, when preparing or acquiring computer programs, adopt IT solutions that ensure interoperability and applicative cooperation (…) and that allow the representation of data and documents in several formats, at least one of which is open, unless there are special and exceptional needs. (Gazzetta Ufficiale, 2005, translation by the author)

In 2012, the Agency for a Digital Italy (AgID) was established by Legislative Decree 83/2012, replacing CNIPA (which in 2009 had taken the name DigitPA). AgiID was given the task of coordinating administration in the three-year plans for IT, promoting thereby the digital transformation in Italy. The CAD was modified and integrated with Legislative Decree 179/2016 and 217/2017, for rationalisation purposes. In the current version, it presents the following definitions of 'interoperability' and 'applicative cooperation':

> d) interoperability: characteristic of an information system, whose interfaces are public and open, to interact automatically with other information systems for the exchange of information and the provision of services;
> e) applicative cooperation: the part of the Public Connectivity System aimed at the interaction between the information

> systems of the participating subjects, in order to guarantee the integration of metadata, information, administrative processes and procedures. (Gazzetta Ufficiale, 2017, translation by the author).

European and Italian policy-making around digital interoperability has primarily focused on the sphere of e-government and the efficiency of public services. There has not been any intervention aimed at regulating interoperability in the private sphere (for example, around the issue of automation in homes, and the internet of things).

8.4 INTEROPERABILITY AND/AS POLITICS: Public values and market logics

The theme of interoperability exceeds technical issues and pervades multiple social worlds. It infiltrates the sphere of politics and makes visible tensions and conflicts among heterogeneous actors (institutions, private mega-players, small local actors, communities) about the orders of value at stake.

As shown, interoperability is closely related to standardisation. Computer software incorporates common standards, which are 'bundles' of rules and dialects. Interoperable standards enable software applications to communicate with each other despite differences in their objectives, languages, functions, etc.

In literature, a distinction is often made between 'open' and 'closed' standards (Lessig, 1999). Open standards are accessible to everyone, regardless of business model, company size, or exclusive rights held by the parties. They are publicly available and evaluable, non-binding, nor dependent on non-free software, and are managed and developed independently. Examples of open and interoperable standards are REST, HTML, and ODF. The ability of different software to write data in common formats, communicate with shared rules, and mutually exchange data is considered a necessary condition for the development of computing, its ability to

act on the world, and the very dynamism of knowledge (Russell, 2014). The existence and use of open standards make it virtually possible for consumers to choose from a wide range of software; different applications, for example, can base their operation on the same open and interoperable standard format. In such a perspective, consumers are free to choose between competing products, influence their success or failure on the market, switch products without being afraid of losing functionality or control over their data (West, 2007).

Closed standards, on the other hand, are not usable by developers, or are only usable with restrictions. This severely limits freedom of development and, consequently, consumer choice. Therefore, some market niches are dominated by big players that impose their closed standards and prevent other companies from interoperating; monopolies are thereby established in which competition is prevented, to the detriment of consumers. In such circumstances, customers are locked-in to the supplier – changing software would be impossible or too expensive – and deprived of guarantees about the future of the software applications they bought (ECIS, 2020).

In several cases, the European Court has condemned large companies such as Microsoft and Apple for violating competition laws on interoperability. The non-profit organisation European Committee for Interoperable Systems (ECIS), which aims at limiting antitrust issues by protecting interoperability, has especially focused on cases of anti-competitive behaviour by Microsoft. In order to eliminate competition and establish lucrative monopolies, since its inception Microsoft has pursued a number of illegal strategies based on the removal of interoperability between its products and third-party software. These strategies were tracked down by ECIS in a paper with references to the various convictions suffered by Microsoft (2009). According to ECIS, one of the strategies Microsoft had most often been adopting was to withhold information about the interoperability of its products – or even to

manipulate APIs to obstruct it. This is the case, for example, of the 'elimination' of the Novell WordPerfect word processor. Microsoft retained essential technical information to enable WordPerfect interoperability, and then went so far as to modify the Windows APIs to degrade the WordPerfect user experience. The elimination of the Netscape browser went along the same lines: Microsoft designed Windows to make – as its then-Vice President Brad Chase stated – "running any other browser a jolting experience" (cit. in ivi, p. 11). Microsoft's 'founding' tactic, however, would be 'embrace-extend-extinguish' (EEE): to 'embrace' a competitor product by developing software compatible with it or incorporating a public standard; to 'extend' such software by adding features that are not interoperable with such product or standard; when the extended product becomes a *de facto* standard and users are locked-in to it, to extinguish it by cutting off any last semblance of compatibility. Many are the examples of these strategies reported by ECIS and condemned in European and American courts: the elimination through MS-DOS of the DR-DOS competitor and its open DOS standard; the elimination of Sun Microsystems Java through the incompatibilities Microsoft infiltrated in its proprietary Microsoft Java VM version; the adoption and then the extension (or rather, the customisation) of HTML and CSS standards in Internet Explorer, etc.

In this sense, interoperability pervades collective concerns. Far from being a technical and neutral property, it appears as a potentially critical issue, through which tensions emerge between public values and market logics of action.

8.5 INTEROPERABILITY ENTERS SOCIAL SCIENCES: Science and Technology Studies

The topic of interoperability has long been absent from the social sciences which, at present, still show scant interest on the matter.

The first contributions on the theme date back to the 1990s

and can be placed in the archipelago of Science and Technology Studies. Historically, the concept has been primarily addressed in the ecological strands of STS (§ 1.1). During their research on the connections between information artefacts, Susan Leigh Star and Geoffrey Bowker picked up the notion of 'interoperability' from computer science and worked it through with the concept of 'convergence' (Bowker & Star, 1999; Star et al., 2004). While interoperability regards the technical integratedness between infrastructures, convergence concerns the sociotechnical and mutual entanglement between social worlds and information artefacts. In particular, Star and Bowker defined convergence as "the double process by which information artefacts and social worlds are fitted to each other and come together" (ivi, p. 2). On the one hand, a given information artefact is partially constitutive of some social world; on the other hand, any given social world creates, through bricolage, a set of interlinked information resources. This is a process of mutual co-constitution between social and technical processes: for example, a repository of preprints like arXiv, has – in a certain space-time – at least partly co-constituted the academic community of physicists; that same community, on the other hand, co-constructed arXiv itself. Put briefly, "information artifacts undergird social worlds, and social worlds undergird these same information resources" (ibidem). Such co-constitution between social and technical processes does not happen linearly or once for all, as convergence emerges as an unfixed 'layering up' of solutions, conventions, and standards. When information artefacts and social worlds converge, they form "information worlds" (Chatman, 1992), i.e., the spheres of information resources employed by individuals and organisations to solve problems, play, work (e.g., libraries, databases, services for asking for opinions and advice, etc.).

The insights of this seminal ecological strand have been taken up by several authors working in STS. For example, the Comparative Interoperability Project used qualitative research methods to comparatively study 'interoperability strategies' in some

infrastructures. Interoperability strategies were conceived as "tied configurations of technical approach, community mobilization, and organizational structure" (Ribes, Baker, Millerand, & Bowker, 2005, p. 65). This was an interdisciplinary project in which an interdisciplinary team of sociologists and scientists (Geof Bowker, Karen Baker, Florence Millerand, David Ribes, Jerome Wanetick, Elena Aronova, Beth Simmons, Steve Jackson, Brian Lindseth, Joan Donovan) worked together with science communities. The starting idea was that "[d]ata is a form of infrastructure. By this we mean that it is not a tool for a single scientist or even a research team, rather it is (…) the common goal of a collective" (ivi, p. 65).

David Ribes – who participated in the Comparative Interoperability Project – has devoted some research to the theme of interoperability (Ribes & Polk, 2015; Ribes, 2017). He is particularly interested in 'data interoperability', which he defines 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)[5]. Through grounded ethnographic observation and archival analysis, the author identifies some "sociotechnical qualities" of it. Interoperability is historically inscribed, since it is embedded with traces of its integration trajectory and transports its consequences into the future; infrastructural, since it bears characteristics that Bowker and Star attributed to infrastructures (§ 1.1); contested and negotiated, since data integration is not an extra-social process; epistemically consequential, because data integration affects what can be known and how; relatively irreversible, because it is path dependent, but sometimes questionable; seamful and seamless, because working with interoperability is seamful, but successful interoperability supports seamless work; becoming a value, norm or virtue: "once a means to a specific end, interoperability is becoming an open-ended value" (ivi, 1516).

5 Interestingly, this representation of the idea of interoperability brings it close to the idea of integratedness as described above (§ 8.2).

Several further relevant contributions can be found in this perspective – sometimes hybridising with the literature in the field of Computer-Supported Cooperative Work (CSCW); they address the issue of interoperability in the spheres of healthcare (Ellingsen & Monteiro, 2006), design (Mongili, 2014), organisation (Sharma & Sawyer, 2016), welfare (Cozza, 2018). Within social sciences, interoperability is currently studied also in data studies, by the 'Exeter group' in particular (Leonelli, 2012; Tempini & Leonelli, 2018; Leonelli & Tempini, 2020) and by the team of Christine Borgman and her collaborators (Edwards, Mayernik, Batcheller, Bowker, & Borgman, 2011; Borgman, 2015). Through these approaches, data practices are investigated, and the journey of data is observed through social spheres, disciplines, times, and spaces, in order to explore uses, experiences and effects. Interoperability is thus seen as a relevant episode in the journey of data that can change stories and generate social consequences.

REASSEMBLING ECOLOGIES IN HIGHER EDUCATION

FOLLOWING INTEROPERABILITY-IN-ACTION IN 'SAPIENZA'

9

As described in the previous chapter, interoperability today penetrates multiple spheres and the individual and collective social life, as well as national, international, and transnational policy. From a technical point of view, interoperability is generally defined as a 'connective' capability of heterogeneous software applications to 'talk' to each other and work in a coordinated way (§ 8). Is it possible, though, to observe it beyond a technical outlook and grasp its social aspects? And how does it emerge in the processes, practices, and organisation of higher education? What does it do?

In order to investigate these questions, I shall follow interoperability-in-action across the Sapienza digital ecology in order to examine its emergence and performance. Interoperability will be thus analysed as an ongoing sociotechnical enactment rather than a fixed technical state. It will be therefore understood as connectedness-in-action (Gherardi, 2005; Hopwood, 2014), i.e. an emerging process where connections among data and infrastructures are woven together across (and within) heterogeneous ecologies.

The observation will be carried out along three fields – from visibility to concealment – in which interoperability unfolds. First, a micro-sociological eye will be adopted to observe its effects on the situated *practices* of Sapienza's professionals (§ 9.1). I will thus analyse how it becomes visible in the everyday professional life of academics, IT specialists, and students. Thereafter, I will examine some value-laden professional visions and organisational *cultures* that interoperability ideas and software applications conceal and perform (§ 9.2). Lastly, I will focus on the *associations* that are

estabilished in the Sapienza digital ecology through interoperability-in-action. In particular, I shall discuss how interoperability processes knot together a sociotechnical texture that intra- and interconnects the organisation(s), and how interoperability standards interconnect heterogeneous scales in the global space of higher education (§ 9.3).

Three empirical actors[1] will be considered in this examination: the professors, who encounter with the effects of interoperability in their everyday academic life; the technical experts, who craft interoperability over time, in action and collectively; and the non-human materialities of interoperability, which inscribe and perform ideas, and connect and (re)arrange the organisation.

Through this scrutiny, interoperability in Sapienza will be described as continuous connectedness between data, infrastructures, and platforms on different scales and organisational fields, with diverse purposes and values inscribed. National macro-infrastructures for the welfare, transnational standards readjusted for local quality assurance demands, intra-institutional platforms for classroom management, interfaces of global players of academic reputation, and many other actors hang together and intertwine in an ongoing and complex tangle. As shall be shown, this connectedness-in-action holds together a digital ecology and a sociotechnical organisational texture in which communication between actors is continuous (though not infallible or perpetual).

9.1 PRACTICES: The effects of interoperability on the everyday life of professionals

In Sapienza, the workings of interoperability are mostly shrouded by infrastructural invisibility (Star & Ruhleder, 1996; Ribes, 2017; § 1.1.2) and fade into opacity. However, its effects sometimes materialise in the administrative work of professors and the professional life of technicians.

1 See chapter 2, footnote 6.

9.1.1 Interoperability in the professors' administrative work

As far as the administrative work of the professors is concerned, interoperability processes are mostly discernable in the Sapienza platforms for research grant applications, accountability, and teaching.

As shown in the following excerpt, interoperability sometimes becomes visible to professors when they apply for *evaluative procedures* (e.g., career advancements, research grants applications[2], etc.); these procedures – like accontability practices, which will be shown shortly – are based on quality assurance logics. In particular, the connectedness between a funding applications platform and IRIS is framed in the following extract as a set of 'automatisms' that reinforce efficiency in administrative work. Interoperability is thereby naturalised as an extra-social matter – 'automatic', indeed – in which no human intervention is involved:

> When I performed the National Scientific Qualification[3] procedure, there was the possibility to automatically get a list of the [research] products to insert for the evaluation, because the Qualification platform was running on LoginMiur which, in turn, was connected to IRIS. (…) Then I noticed over time that there are a series of automatisms (…) For example, joining a PhD Board. (…) When you perform the procedure, it automatically shows everything you have uploaded on IRIS. When you participate in a research project proposal using Sapienza funds (…), you will automatically see a dashboard linked to IRIS, where you choose the most appropriate research products. (Professor, Faculty of Social Science and Economics, D)

2 As shown (§ 1.1), fund finding is an expertise that academics are asked to develop in the face of the increasing entrepreneurialisation of higher education.

3 The Abilitazione Scientifica Nazionale – National Scientific Qualification is a non-comparative evaluative procedure handled by the MUR. It is required to become university professors in Italy.

Interoperability – or, rather, the lack thereof – also emerges into the *accountability work practices* of professors. Many consultants locate in the administrative work area the weak spot of interoperability processes in Sapienza. The interconnectedness among the complex archipelago of platforms that constitute the Sapienza ecology loses energy in the intricacies of accountability procedures. The absence of interoperability in the technical procedure brings resentment into the professors' experience:

> I think that the most important thing that is done [on GOMP] is the uploading of teaching activity. There, too, there is a system that makes you waste a day when it comes to annual reporting (…) pieces of information do not dialogue with each other (…) all it would take is that information loaded itself and then the professor validated it. (…) For example, classrooms and times are already allocated to the professor. Instead, I have to load them from scratch. (Professor, Faculty of Communication Science)

> IRIS and Scopus (…) are not interoperable. So, there are things [research items] that are available on Scopus and not on IRIS – and things that are on IRIS and not on Scopus. (…) The scientific community is based on Scopus – or Google Scholar, in some areas. This means that someone (…) should keep the systems aligned manually. Clearly, this is madness. (Professor, Faculty of Information Engineering, Informatics and Statistics)

Interoperability also appears in the administrative work around *teaching*. Professors reference the learning management system they use (e.g. Google Suite for Education or Microsoft suite) and how it supports their teaching practices. Applications entwine and interplay within these closed digital ecosystems, and their 'shadow' administrative work (§ 7.4.1) is lightened. Interoperability brings integratedness, and professors are euphoric about that. Data can be entered at one point only, and effective meta-visualisations can be obtained:

> At that point, I started with Google Classroom too. I did that because I needed to invite all participants in Google Meet, and it is more convenient if you do that from Google Classroom. Within two seconds, they [the students] were all in Google Classroom (…) instead of writing a new email and pasting in "Recipients" the address list I got from Moodle, I just open Google Classroom. Then, we all could participate in a Google Meet webinar. (Professor, Faculty of Social Science and Economics, D)

> My experience of [Microsoft] Teams has been absolutely positive. It is an integrated classroom management environment, with ease of use of a whole range of features that also come from Microsoft. In my own way, I discovered the OneNote environment – that I didn't know before – as something extremely easy and powerful. (…) The possibility of having a tool in which to integrate photographs, videos, blackboard – I found that very easy. Another thing I used a lot is Forms, which is quite similar to Google Forms, but it integrates a lot into the platform. [Microsoft Teams] is a class management framework that works perfectly. (Professor, Faculty of Civil and Industrial Engineering)

9.1.2 Interoperability in the technicians' professional life

Interoperability in action also appears across the technicians' practice. They showcase interoperability for me. In their expert narrative, they describe the heterogeneous interfaces, processes, and techniques through which the journey of non-homogeneous data is mediated. Technique is a matter of interest to them, but interoperability appears again as a technical black box. There is 'nothing to invent' in inherited repertoires. A world of *standardisation* and 'classic' operations emerges wherein innovation is possibly present but as a tacit and everyday act. Technicians appear as the human component of the technical procedure:

Leonardo: So, what are the 'ingredients' for interoperability in Sapienza? Standards, protocols…

InfoSapienza IT Specialist A: Well, let's say there are many standards. What goes for the most is the HTTP protocol, which uses JSON files as a transport protocol.

Leonardo: And that's what 'connects' software applications…

InfoSapienza IT Specialist A: That's right, yes. People tend to use JSON files because they are easier to manage and handle than XMLs.

Leonardo: Didn't you need to customise these protocols?

InfoSapienza IT Specialist A: No, they have been standard for decades. There are rules, and you've got to follow the rules. There are the various 'call' methods: GET, POST, PUT… These operations are coded in the protocol. We are not inventing anything.

Leonardo: Do you use only REST and SOAP as protocols?

InfoSapienza IT Specialist B: Yes, (…) the classic WebServices. We didn't invent anything particular.

Leonardo: Did you just put them there, or did you customise them…?

InfoSapienza IT Specialist B: The WebServices have to be queried; they are JSONs. We use classic operations.

InfoSapienza IT Specialist A: No, they have been standard for decades. There are rules, and you've got to follow the rules. There are the various 'call' methods: GET, POST, PUT… These operations are coded in the protocol. We are not inventing anything.

However, interoperability in Sapienza also appears as an indefinitely unfolding and in-the-making tinkering process (Knorr-Cetina, 2001) in Sapienza. This is the case of the CERIF (Common European Research Information Format) standard. CERIF, which is the most widespread interoperability standard for CRISs (Clements, de Castro, & Bryant, 2019; § 4.1), is being developed from 1988 by a European Union team (Van Woensel, 1988). It entered Sapienza in 2015 through the mediation of CINECA (§ 4.1) as a part of its IRIS CRIS (§ 5.1; § 6.2); today, CERIF intra- and interconnects the whole Sapienza ecosystem. CINECA developed a local rearrangement of such supranational standard. The aim of such "extension" is to comply with the demands of the Italian higher education system on quality assurance and evaluation. IT developers tinkered in practice with CERIF to comply with such requirements:

> In the professors' curriculum vitae, a series of very fine-grained information has been included for ministerial needs, distinguishing between types of fellowships, ministerial assignments, etc. CERIF does not reach that level of granularity. (CINECA IT Specialist)

> From the point of view of curriculum vitae, you might think that once you have published your stuff, it remains there (…). Well, ANVUR wants to know exactly what you have produced until that date, and in which universities you were working. (CINECA IT Specialist)

The CERIF "extension" that has been crafted by CINECA's IT Specialists thus expands the detail of information that can be stored and circulated:

> The CERIF standard is on a level of abstraction higher than the one we deal with in our [CINECA] systems today. (…) For example, the cash flows at the level of research projects. Our granularity goes to the single line of the invoice charged on the project (…) So, this is an 'extension' – let's say – of that model. (CINECA IT Specialist)

Based on the specific demands of the Italian higher education system, the CERIF transnational standard has undergone deep re-adjustments, local tinkering practices, and an overall translational work mediated by the CINECA consortium.

9.2 CULTURES: Interoperability as a non-neutral issue

Interoperability-in-action is a non-neutral issue in the Sapienza ecology, as cultures are performed when information and infrastructures entangle. On the one hand, practitioners perform – both as a *habitus* and a constant innovation – epistemic cultures (Knorr-Cetina, 1999) that influence their way of seeing organisation, representing processes, and leading their everyday professional life. These visions act in the world, as they inform software, curricula, policies, etc. On the other hand, interoperable artefacts are value-laden, since they encapsulate and perform ideas and normative theories (Selwyn et al., 2016) of what an organisation – or higher education itself – is or should be. Users can diversely align or resist these visions (Cabitza & Mattozzi, 2017; Souto-Otero & Beneito-Montagut, 2016).

I will now describe some hidden cultures embedded in the visions and materialisations of interoperability in Sapienza, and discuss their non-neutrality. First, I will present some professional visions (interoperability by design, by practice, and in organising) that I have identified consulting IT specialists in Sapienza (§ 9.3.1). Thereafter, I'll present two cases of interoperability software in development or currently used in Sapienza, and unpack the organisational logics they embed. Drawing on the Gareth Morgan's organisational metaphors (1996), I'll focus on the mechanicist organisational culture inscribed in the Sapienza GISP software (§ 9.3.2), and on the organicist-ecological culture inscribed in InfoStud (§ 9.3.3).

9.2.1 Professional visions: Interoperability by design/by practice/in organising

In Sapienza, interoperability appears as a complex and value-laden object that technical experts frame and perform according to heterogeneous visions and logics (Bijker, 1997; Knorr-Cetina, 1999).

For some experts, it is a serious issue. On an architectural level, it is framed as an approach that integrally innervates the software application; on a hierarchical level, it should be carefully designed before the development – it cannot be applied as a mere hotfix to a completed product. Within this *interoperability by design* vision, it is thus considered as an object for professional reflexivity (Schön, 1983):

> "Cooperation" is when the whole architecture of the application is designed that way. (…) And for it to be so, cooperation must be 'by design'. (…) All the other stuff that people do now – they're just patches to make applications talk to each other. It is as if you had a car and say: "When I have to go to the mountains, I pull the lever and put the four-wheel drive". That car wasn't born with the idea that it could work with four-wheel drive, OK? A car born with permanent four-wheel drive – that is very different. (InfoSapienza IT Specialist A)

> Most systems achieve a 'functional' – let's say – interoperability (…) Two APIs cobbled together are not enough. You must have a basic idea, which is that of a collaborative, cooperative product. There has to be a political will; then, you can design interoperability. (Professor, Faculty of Information Engineering, Informatics and Statistics)

Designing such a form of interoperability is now even more difficult because of market and competition reasons:

> Clearly, they do not want to open up [their software applications] to the competition. So, what is the problem between the CINECA software and the GOMP software? They are competitors – they hate each other. (Professor, Faculty of Information Engineering, Informatics and Statistics)

By contrast, other developers frame interoperability as a tool for extensions and *maquillage*, rather than a unique and exclusive mode of existence for software. In the *interoperability by practice* vision, interoperability emerges from – and for – the professional practice. It is a pragmatic and situated use of interoperability. The design phase and its principles are removed, while direct incorporation is performed straight away:

> At the central level, we query these GOMP services, and 'suck' the information. We make it more beautiful from a purely communicative point of view, and expose it back to our students. (InfoSapienza IT Specialist B)

> Various pieces make up this large mosaic called GOMP. We polish up the information, we put it all together, and we query these services practically in real-time. (Be Smart IT Specialist)

Finally, I could trace a vision of *interoperability in organising*, that concerns:

> integratedness between the university's management processes. Namely, the possibility that a research process is intended as a possible entry point of a central management process activity. It is part of the dialectic (…) between research processes and the various management processes that are present in the university. (CINECA IT Specialist)

In this vision, interoperability is practised as a 'development model' for software, and it connects IT and organisational aspects. It also concerns the management of organising processes (Orton & Weick, 1990) and articulation work. Consultants complain about the delay in the interoperability of organisational processes in Sapienza, compared to the corresponding software affordances:

> From a problem of interoperability of information systems, there is now a need for greater integration of management processes in higher education. (…) If the software does not give you the possibility to implement this interaction, you

> clearly won't be able to do that – but if the software does, and it [integratedness] is not present in the university's organisational model, you can do very little. (CINECA IT Specialist)

9.2.2 Organisations as machines: Interoperability in the Integrated Space and Asset Management (GISP) platform

The non-neutrality of interoperability in Sapienza appears also in the inscriptions embedded in the very platforms. This is the case, for example, of the GISP (Integrated Space and Heritage Management) software, currently[4] under development at Sapienza.

GISP was created around the issue of spaces in Sapienza. Sapienza holds about 650.000 square metres of surface area where teaching, research and administrative activities are carried out, and services are supplied for the university community and the City of Rome (Sapienza, 2020d). This rich and heterogeneous heritage – in terms of usage and spatial distribution in the area of Rome – includes about 120 structures.

The management of these spaces – and, in particular, the capacity of classrooms – has always been a critical issue for Sapienza. Several platforms devoted to managing Sapienza's spaces have stratified on each other over the years: from the Space Monitoring platform (ivi), to *ad hoc* functions in GOMP, to software applications that have now decayed.

> There was a classroom management system – developed by some physicists – that was really well done. It was convenient, efficient, effective. They retired – and the system imploded. You know – you don't just put computer systems up and they stay there; you have to constantly maintain them. The release of the language changes, and there's a lot of updates that you have to follow. (InfoSapienza IT Specialist D)

4 The development and testing of GISP suffered a setback with the emergence of the Covid-19; for this reason, it was not possible to empirically investigate its operation beyond the initial stages of development.

An internal actor of Sapienza phones me to tell me about GISP:

> GISP, meaning Integrated Space and Heritage Management. At the moment, it is under development on a pilot portion of Sapienza. It is a new platform that we are developing with a company in Rome. We acquired software from Genoa and then developed it within Sapienza. (Governance actor B)

I had examined Sapienza's archives before asking this consultant to tell me about this platform. In the official documents, GISP has two objectives: "a more effective control of the consistency and use of the assets by the central bodies, in order to also optimise the use of these bodies", and "the implementation of new and innovative procedures and working methods in a vast, widespread and diversified administrative environment (central and peripheral), in order to significantly improve its effectiveness and efficiency" (Sapienza, 2018, translation by the author).

GISP's history began in June 2017, when a Commission for the rationalisation of the spaces assigned to Sapienza's structures was established. Its declared objective was to identify suitable criteria to achieve a better homogenisation and rationalisation of the spaces assigned to the individual structures, so as to foster functionality and identity of functions and place. In June 2018, a Board of Directors was established to coordinate the activities related to the implementation of the platform for the management of real estate assets, with the same composition as the Commission. At the end of October 2018, a Working Group for the implementation of the platform was established.

GISP is meant to work as a database with information on Sapienza spaces, and as a harmoniser providing overviews for data from heterogeneous sources. It will receive data from various sources, and will not expose public APIs – i.e., make it openly accessible to the outside. In particular, it is intended to integrate data from U-GOV Payroll, U-GOV Structures (organisational structures with organisational positions), U-GOV Careers and Salaries (staff

on duty), GOMP (some classroom features), Laboratory Census (laboratory features). It will also use its own database in which the Building Management area will upload building plans.

Such platform was thus envisaged as a collector that "will allow to obtain a better productivity, because it enables to remove unnecessary intermediaries and centralise everything" (Governance actor B). Its purpose is to trace the Sapienza's spaces and their use:

> Starting from the operational documents on all Sapienza offices, it maps the spaces – the allocation of spaces and their use, as well as the positioning of people in the spaces. One day, it will also contain information on where the inventory equipment is located (Governance actor B).

The main advantage of GISP, according to the actor I consult, is that "it will allow to connect and process information that was previously scattered everywhere around" (Governance actor B). Access to GISP will be granted to managers, who will have a tool to manage the assigned spaces, review who is using them and obtain information on these users; and to the central administration, to make synthetic elaborations on the use of spaces.

A specific idea of organisation emerges from the empirical data collected on GISP. In particular, a mechanical and bureaucratic organisational logic (Morgan, 1998) is apparently inscribed in such platform. Indeed, GISP covertly envisages organisations as rational and technical systems that operate efficiently only if provided with due planning, coordination, command, management and control. As a matter of fact, GISP is expected to provide an all-encompassing and seamless 'one-stop shop' that would bring to integration Sapienza's loosely coupled and complex organisation; a disconnected mess shall thus be transformed into an integrated whole, and chaos extracted from order (Latour, 2005). Sociotechnical complexity is made governable through "objective indicators", risk control and technologies, to which is delegated the "management of all processes" (Sapienza, 2018, translation by

the author). As to interoperability, it is embedded through a centralising algorithm. The objective of mechanical connectedness is indeed to centrally aggregate and collect information rather than redistributing and sharing it.

Such a vision does not emerge in a vacuum. Rather, it is the effect of the entrance of corporate and technocratic logics into the field of higher education (§ 1.2.2). Indeed, these are transfer and transformation processes (Gherardi & Lippi, 2000) that, from business administration and the market, reach into public administration and the governance of higher education.

9.2.3 Organisations as organisms: Interoperability in InfoStud

However, GISP is not the only case in Sapienza in which the performativity of interoperability can be observed. Indeed, it can also be analysed in the case of InfoStud (Fig. 28), which is Sapienza's online student secretariat and the most used and well-known platform in Sapienza ecology (§ 5.4).

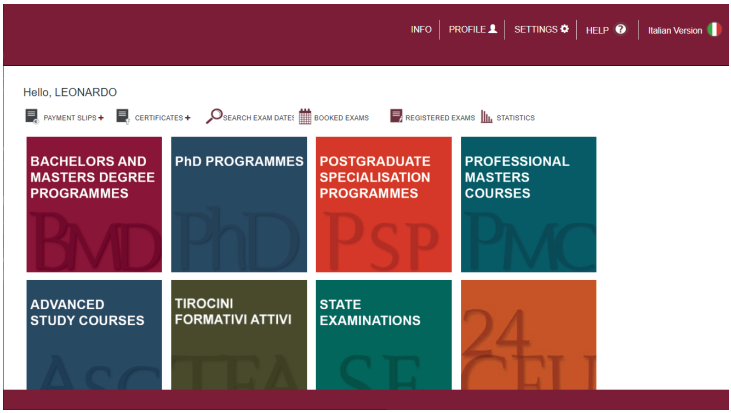

Figure 28. The InfoStud frontend interface (source: screenshot by the author; last access: November 2020)

The InfoSapienza's consultants – they are computer scientists, computer engineers, physicists: "you will find a bit of everything

here, more or less nerdy" (InfoSapienza IT Specialist B) – described InfoStud to me in its technical features and told me its history. Materially speaking, InfoStud is built as a collection of interoperable micro-services, i.e. APIs. This makes such a software application intrinsically oriented to interoperability – or rather, to "applicative cooperation", as defined by the developers: "We lay out a set of APIs with which the application can basically do a lot of things. You have to actually think about cooperation if you want to do it" (InfoSapienza IT Specialist A).

InfoStud's interfaces for interoperability are publicly exposed:

> Everyone can use them [the APIs] to develop her interface. There is nothing secret about them. As a matter of fact, there are several third-party apps for mobile phones – from Android to iOS (…). Very nice, very well made – free of charge, of course. Clearly, Sapienza developed its own too. (InfoSapienza IT Specialist A)

In addition to these third-party apps[5], the InfoStud APIs are queried from further software applications within the Sapienza ecology. Since these APIs are public, "if you want, you can launch the terminal, query the InfoStud APIs, log in and do everything from there. Of course, the interface is fancier. But anyone can do what they want – you just have to query the APIs" (InfoSapienza IT Specialist A).

What has been learnt in the field suggests that a specific idea of organisation is embedded in the InfoStud sociotechnical arrangement. In particular, it is seemingly inscribed with an *organicist and ecological organisational logic* (Morgan, 1998; Trist, 1977). In such a vision, organisations are not self-sufficient entities, and they live in a complex and constantly evolving ecosystem where they have to interact with other organisations. A collaborative rationality can

5 These third-party applications are often the outcomes of experiments by students, e.g. Infostud Lab (informatica@sapienza, 2020), OpenStud (Sarra, 2020), and InfoStud CLI (infostud_cli, 2020).

also be identified in InfoStud script, as it fosters the emergence of collective co-creative practices among actors. Indeed, by providing authenticated users with the possibility to query its APIs, InfoStud empowers them as co-developers who can build alternative tools. The design shown in this case is more human-centred than the traditional one observed in GISP. Knowledge is shared with social actors as a participated resource, rather than stockpiled as a tool to manage and for managing. Such a distributed (i.e., non-centralised) interoperability algorithm enables the continuous infrastructuring of new technologies and networks, as well as the emergence of informal learning networks among users.

9.3 ASSOCIATIONS: Following interoperability-in-action across the Sapienza digital ecology

In the previous paragraphs, an observation has been set on the practices and organisational culture that interoperability enacts in Sapienza. I will now attempt at foregrounding the less visible aspects of interoperability-in-action in Sapienza. In particular, I will look at the associations (Latour, 1984) that are established within this digital ecology, and their effects.

In particular, I shall address how interoperability knots a sociotechnical organisational texture that intra- and interconnects the organisation(s) (§ 9.3.1), and how interoperability standards interconnect heterogeneous scales in the global space of higher education (§ 9.3.2).

9.3.1 Interoperability as a sociotechnical organisational connective texture

In Sapienza, the sociotechnical processes of interoperability weave together an organisational and communicative texture that allows heterogeneous actors to intertwine on different scales, and the ecology to hold together. In particular, interoperability sometimes appears as an *intra-institutional organisational texture* (Gherardi,

2006) that establishes relationships and enables the mutual interconnection among local digital services in the Sapienza ecology. Institutional infrastructures constantly address 'queries' towards each other in this intricate tangle. Organisational processes thereby constantly entwine and emerge:

> What happens when a student wants to book an exam? The reservation has to be booked through InfoStud. In order to determine the list of exams that can be booked, InfoStud will query GOMP to see if the student has submitted on GOMP her/his curriculum and if it's been approved (…). If s/he has, GOMP will show her/him the list of all the courses contained in her curriculum that are compatible with her year of enrolment. (…) If s/he hasn't, [GOMP] will display the mandatory courses only, for each academic year compatible with her year of enrolment. (…) This is an example of interoperability between the two systems [InfoStud and GOMP]. (InfoSapienza IT Specialist D)

> When there is a modification on the U-GOV side, we automatically 'see' it in GOMP. (…) So, if I change a lesson, or I change the semester, or I modify the education offer, or I put a substitute professor in the place of another professor who has gone on maternity leave, or sabbatical leave, or whatever else – this will be also shown on the public website of Sapienza, the one accessible to everyone: corsidilaurea.uniroma1.it. (Be Smart IT Specialist)

In a specific case, this connectedness among intra-institutional public administration infrastructures was made possible by the connectedness between two IT companies that were co-crafting interoperability. In 2020, InfoSapienza and Be Smart collaborated to the construction of an API that would have made available to InfoStud some documents that were previously uploaded on Be Smart's GOMP only:

> We chose the GOMP path. We studied an analysis together with Be Smart, i.e. a technical modification for setting up how to 'expose' the new objects. (…) It takes 2-3 weeks after the

> analysis, because your supplier doesn't work just for you – it has many activities. So, we also have to be smart and move a little bit earlier, because we know what the response time of the supplier is. (InfoSapienza IT Specialist B)

In Sapienza, interoperability unfolds also beyond the intra-organisational field. Indeed, it also takes the form of an *inter-institutional organisational texture*. It can in fact emerge as real-time interconnectedness with processes and services that are partly external to the university. For example, Sapienza connects to national databases for invisibly supporting the practices of students that have to pay tuition fees:

> The [interoperability established with] INPS[6] is perhaps the nicest one – a real 'textbook' interoperability. Through InfoStud, you pay tuition fees. You have to pay tuition fees according to your ISEE[7] value. So, you press a button, and we query the INPS database, which gives us your ISEE value, if any – after you have given us your consent, of course. (InfoSapienza IT Specialist A)

In Sapienza, interoperability does not always 'work' – especially in the early stages of its deployment. When interconnectedness cannot be knotted, the governance might intervene to fix the breakdown. Interoperability can thus appear as a *torn connective texture* that must be mended for the organisation to return to ordinary (i.e., interconnective) life:

> The acquisition of information from INPS is a complex process (…) When we put it in place – 2015, if I remember cor-

6 The INPS (Istituto Nazionale della Previdenza Sociale - National Social Security Institute) is the main social security body of the Italian public pension system.

7 ISEE (Indicatore della Situazione Economica Equivalente - Equivalent Economic Situation Indicator) is an indicator that aims at measuring the economic condition of households in Italy. It takes into account the income, assets and characteristics of a household.

> rectly – there were problems as soon as we started, because INPS did not respond to our queries; it did not respond properly. Tuition fees got stuck; the students could not pay. When they paid, they paid all together. The service went down. The [Sapienza] General Director of the time had to intervene. He called the INPS General Director and asked him what was going on. From that moment on, there was no problem. (InfoSapienza IT Specialist A)

9.3.2 Interoperability as connectedness across the global space of higher education

The connections established by interoperability can be followed also on a wider level, namely, by looking across the global space of higher education. For example, well-established global technical interoperability standards such as the REST APIs (§ 8.2) enable the interconnection between the Sapienza local institution and global de facto standards for academic prestige in higher education, such as citation database. The Sapienza CRIS platform CINECA IRIS (§ 5.1) can thereby connect with the global arena of inter-academic competition in higher education. Academics are indeed expected to attach (Piattoeva & Saari, 2020) to citation databases and indicators in order to rank high in the academic social

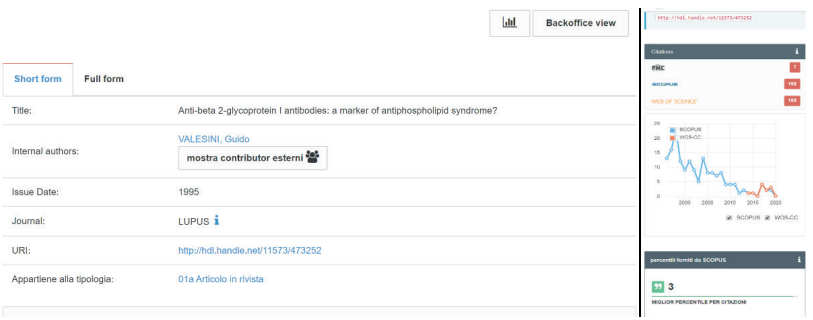

Figure 29. The frontend interface of IRIS IR's 'public area': IRIS and citation databases interconnecting (source: screenshot by the author; last access: November 2020)

field. These reputational boundary objects perform a 'compliance' interoperability in Sapienza inasmuch they act as obligatory passage points (Callon, 1984) with which it has to keep a persistent connection in order to preserve international and national visibility. Indeed, the performance of the research products uploaded by Sapienza professors on IRIS is measured through the number of citations on Web of Science, Scopus and PubMed, and visualised accordingly (Fig. 29).

Thereby, uniformities are established and realities are performed (Landri, 2018) that converge towards the master frame of the evaluability of academic outcomes. Indeed, these reputational standards do work in the world, as they embed a quantifying logic (Espeland & Stevens, 2008) that resignify academic work by tacitly articulating what really matters within the academic field and should therefore be maximised (Mennicken & Espeland, 2019). Certain ways of knowing are thereby privileged, while others are made invisible, and new uncertainties and stress insinuate in the academic practice and on academic quantified selves (Lupton et al., 2017; Burrows, 2012). Across this constant interconnection between the local institution and the global sphere of competition, market logics are introduced that interfere with the public nature of higher education in Italy (Espeland & Sauder, 2016; Decuypere & Landri, 2020).

⋆ ⋆ ⋆

In this chapter, I have tried to move beyond a technical outlook on interoperability by observing it as connectedness-in-action. I have therefore followed it in higher education along three fields in which it performs its effects, i.e. practices, cultures and connections.

From the analysis carried out, interoperabilities emerge as complex sociotechnical processes in which continuously knotted connections among infrastructures and data hang together producing

wider ecologies and organisational textures. From a singular idea of interoperability as a static and inert property, it is thereby possible to reach a plural idea of interoperabilities as multiple and ongoing processes that reciprocally interconnect.

These are very active processes. On the one hand, they are continually on-the-making and tinkered with by technicians. On the other hand, internal and external connectedness inscribe values and beliefs, it can bridge worlds and stories thereby producing possibly unexpected organisational, social and political effects.

Professional and epistemic communities experience interoperability differently. For technicians, it is a visible object as it is part of their professional practice. However, it mostly remains blackboxed as a set of standardised and inherited procedures that they – being a component of the technical system – incorporate and reproduce. For professors, interoperability is an invisible sociotechnical apparatus and a generally unfamiliar issue. Depending on their degree of expertise in technology, they may be variably able to grasp interconnections – and, if anything, move from a purely technical conception to a sociotechnical one.

Interoperability is ever more relevant now in the field of higher education, where its processes and practices are becoming increasingly complex around the issue of quality assurance (§ 1.1.3). As shown through the case of Sapienza, interoperability is indeed mostly deployed when aimed at bringing together and interconnecting infrastructures and platforms that evaluate the quality of higher education systems, institutions, and professionals. Information (on professors, funding, research, publications, participation to boards, etc.) can be harmonised, and data constructed in diverse organisational fields can be mashed together (Kitchin, 2014) through the creation of interoperability standards that interlink diverse data sources. The digital academic sphere becomes somewhat 'karstic': data is entered at one point of the ecology, then it flows invisibly across and underneath the infrastructures, to finally emerge elsewhere – in 'purity' (whatever that means), or, much

more often, entangled and 'harmonised' with additional data – and effect the practices of academics or administrative staff (Piattoeva & Saari, 2020). Within these complex processes, higher education institutions both produce their own local infrastructuring processes and are inextricably attached to wider spaces. These are, for instance, global arenas of competitiveness, but also sociotechnical inter-organisational meso-translators that readjust interoperability procedures to the demands of local higher education systems. Digital ecologies in higher education are knotted together through this ongoing interconnectedness.

FINAL REMARKS

> There are times when I catch myself believing that there is such a thing as 'something' which is separate from 'something else'.
>
> (Bateson, 2012)

In this work, I have attempted to explore the digitalisation of higher education in the global and Italian arenas. In the previous chapters, I discussed through empirical data the processes of penetration of online platforms into global and Italian higher education, the practices performed by users engaged with online platforms in the Italian context, and the wider ecologies that the interconnection between platforms in higher education performs.

I have considered the processes of infiltration of some online platforms into higher education across public and private, global and local, technical and political spheres. The online platforms I examined traversed diverse disciplinary communities, conveying a behaviourist vision. I have also observed the use in practice of these platforms in an Italian university, and its effects. I have thereby been able to emphasise how they permeate governance choices, IT development, and the professors' practices by stimulating heterogeneous forms of engagement. Indeed, such artefacts do not appear as extra-social background elements but rather as socially and politically operational objects. Finally, I followed the idea and processes of interoperability in the digital ecology of the same university across standards, practices, and cultures. Thereby, I presented interoperability beyond a technical outlook, i.e. as an emerging process of connectedness-in-action that often supports quality assurance activities.

Since I did not possess strong technical expertise, I had to rely on the expertise of 'natives' with their own visions of the 'technical' and the 'social'. This intense proximity to the field has perhaps

led to biases of various kinds, and fallacies of misplaced abstraction (Bateson, 1936). As I continue this journey in the future, I will attempt to detach from this field and fully grasp what has emerged.

In this concluding chapter, I would like to revisit the main topics I have discussed in the research in order to reflect on some wider issues, and identify tensions and ways out.

University teaching in pandemic times

Different ways of understanding and practising university teaching have been coexisting in the Italian scenario in the last few years. Some professors reproduce a transmissive *habitus* and teaching models based on the sacredness of their profession. This vision is based on an elitist understanding of higher education, and a bureaucratic and mechanistic idea of organisation. However, there is more to the story than that. Teaching means co-constructing knowledge together rather than flinging information from one side of the classroom to the other. Innovative practices and experiments have been emerging in Italian higher education that incorporate new visions of teaching, academia and organisation.

It is not easy to discern what happened to this intricate landscape with the emergence of the Covid-19 pandemic. All the professors I observed had to change something about the way they work. For many professionals, this was a reconfiguration at the administrative, teaching and organisational level that came with much effort and was laden with emotions.

In some cases, the professors merely transposed their transmissive teaching model and programmes from chalk-and-blackboard to the screen. The medium therefore changed, but not the logic of the practice. Other professors, however, were led to rethink inherited models and reorganise their practising. In these cases, it was a matter of improvising, staying in uncertainty, and relocating familiar routines in unusual contexts (Weick, 1998). Resentment and silence emerged in some cases – from both professors and untenured staff – for the increased workload demanded for distance

teaching to function properly.

In the long term, what might the pandemic mean for the academic profession? What effects shall it have on the organising of universities? How will the everyday practice of professors change if they have to be always present and mobile? On the one hand, this uncertain condition could open new spaces for the emergence of neoliberal and new public management logics. On the other hand, it might well lead to greater reflexivity on teaching practices and to the emergence of innovation in the everyday organisational life.

Existing dynamics are now exacerbated. It seems more necessary than ever to rethink university teaching as a collective and participatory issue, and to equip professors for the upcoming challenges.

Big data 'for good' in higher education?

Traditionally, the Italian higher education is scarcely digitalised. Both infrastructural and cultural interest in information technology has lacked over time. The emergence of Covid-19 forced a sudden transformation to which nobody at any level – academic, institutional, governmental – was truly prepared. Through support from the government, inter-institutional cooperation and the collaboration of staff and students, universities have been eventually able to provide for distance teaching. New sociomaterialities have then filled many classrooms: cutting-edge projectors, motion-tracking webcams, curved monitors, and much more. Together with this, online platforms for learning, teaching and administrative work have received a strong stimulus.

As always, these processes are not without effect. A huge amount of data is invading the servers of national institutions and global big players in higher education. The procedures put in place for security and distance teaching have indeed caused a strong intensification and complexification of online communication; for example, every lesson is recorded (in audio/video format) for

accountability purposes. This has led to an acceleration of the process of datafication – the transformation of social life into data – which was previously only barely noticeable in Italian higher education.

Big data of higher education – like all data – does not exist in 'raw' form. When it will be exhibited and possibly exploited for political use (within predictive or explanatory models), it will have already undergone manipulation (Leonelli & Tempini, 2020). At least two interrelated reflections are possible in this respect. First, as highlighted by extensive literature now, data is not objective. It incorporates ethical choices about what to measure, what to privilege, and what to silence. Moreover, as shown in this research, data is to be understood as an ongoing outcome of connectedness-in-action; the *locus* of data is not the infrastructure, but rather the connection.

What challenges and opportunities might the big data of higher education represent for the post-pandemic social life? On the one hand, some professionals and scholars frame the topic in terms of a neoliberal power structure. Surveillance through data is carried out for quality assurance and accountability purposes.

On the other hand, can it be possible to use this ever-growing data 'for good' in higher education? For example, a future can be perhaps envisaged when recorded lessons are freely provided to anybody in open access. At the very least, this would be a way of counteracting private virtual universities and MOOCs in their own field. However, this might be a part only within a wider transformation. For instance, can the public administration move towards free software and open-source systems? More broadly, how can a deeper democratisation of higher education institutions and knowledge be achieved?

Higher education – what for? Marketisation and reflexivity

It is a contested scenario that we have observed throughout this

work. Tensions and conflicts unfolded over the values around which education – or 'the social' in general – should commit to. Heterogeneous private actors, on different scales, face, clash, co-exist and intertwine with public actors on the local, national, and transnational level. Is higher education better regulated by the public or the private sector?

With increasing vigour, the market is penetrating higher education. Such issue surfaced in this research many times; it was discussed in the chapters about platformisation, practices, interoperability, artefacts. On the one hand, the marketisation of higher education happens through the work of large and small edu-businesses. On the other hand, the sphere of higher education itself is importing the logic and idioms of the market through the paradigm of new public management. The organisational texture of higher education institutions and the academic profession transform with the emergence of accountability, competition, bureaucratisation, and anxiety – and the emergence of Covid-19 might lead to an acceleration of these trends.

The marketisation of higher education also conveys a vision of what the latter should be and do. Higher education is an operational instrument for employability and economic survival. This is a pragmatic idea driven by the private sector and based on the concept of practical effectiveness. It underpins many experiences of virtual universities and MOOCs, as well as new initiatives such as Google Careers Certificates. The pandemic could favour such a form of higher education with abbreviated curricula and often based on distance learning.

However, the market vision on higher education is not the only one existing (although it is often the most visible). Higher education can be also envisaged as a common good and, as such, as something that belongs to all of us. It is a critical business, as Ronald Barnett aptly contended (1997). In this sense, higher education it is a reflexive, transformative and subjectifying experience.

Ultimately, the issue at stake concerns the very purpose – the

'what for' – of higher education. Is that the market or reflexivity? At a time when the market is the predominant solution, we need to understand which side we are on. Is it possible to provide an alternative answer? If higher education aims at building criticality, reflexivity, freedom and participation, then policy-making – at the transnational, national and institutional level – shall have to consider more carefully the processes of agenda-setting as well as micro-decisions to avoid lock-ins and market interferences.

Black boxes and social theory

Throughout this work, I have attempted to show the pervasiveness of naturalisation and neutralisation processes of ideas and technologies in organisational life. Sometimes, epistemologies and artefacts become opaque black boxes which are taken for granted by their users. As described, this process happens in diverse directions. For example, after the pondered and reflexive phase of design, technologies sometimes disappear into the urgency and extemporaneity of practising. Other times, technical fixes become 'factishes' (Latour, 1999) consciously mobilised in the attempt to fix educational, social and political problems; social theory thus becomes invisible or is removed from political choices and governance.

Many blackboxed epistemologies and visions have been described in this work. This is the case, for example, of the behaviourist and knowledge management inscriptions in systemic and centralising platforms for higher education such as CRISs, ERPs and LMSs (§ 3). This is also the case of the strong investment made by Sapienza (at financial and discursive level) on classrooms and infrastructures during the Covid-19 pandemic; at a first evaluation, such expenditure does not appear to be supported by epistemological and social considerations (e.g. on learning models inscribed in the sociomaterial arrangement). Communities of practitioners have differently aligned to the inscriptions in technical artefacts. An inward-looking vision has emerged for tech-

nologists, and a neutralising one for governance staff. Professors too were often naturalising technique; yet, they have also been critical and obstructive as they established a (negative) connection between technology and the sphere of quality assurance.

The risk in these processes is the uncritical espousal of (black boxed) prescriptions about specific ideas of the world – or, at least, of what higher education and its actors should do. Yet, every idea is the result of a contingent and temporary process of stabilisation. Indeed, ideas are not neutral nor technical; rather, they are political and performative; and they could have always been otherwise than how they turned to be (Star, 1990).

Hence, it seems important to fully reappropriate black boxes, from the design phase to the stage of policy decision. Social analysis can make an important contribution thereto and perform work on the world (Law & Singleton, 2013). It should thus be restored to political choices in order to construct informed policies. Thereby, the governance of digital education could operate according to social theory rather than empirical evidence only.

Digital technologies and higher education: A matter of concern

How to understand the relationship between digital technologies and higher education? In the most consolidated narratives, it is a one-sided nexus. The digital is revolutionary and disruptive. It impacts on the processes and practices of higher education, which quietly submit to its power. This is a technological determinism that – in the form of technoeuphoria or technophobia – prescribes a linear relationship between the digital and higher education.

However, this work shows that a more complicated, ambiguous, unstable and ambivalent relationship emerges *vis-à-vis* the cheerful and optimistic rhetoric of Silicon Valley. The digital and higher education – i.e., the 'technical' and the 'social' – are entangled in vulnerable and politically charged co-shaping processes

(Selwyn, 2014). On the one hand, it has been shown that digital technologies do things in higher education. They transport ideas, political theories and disciplinary visions; they influence and construct organisational arrangements; they suggest new practices; and possibly more. On the other hand, though, higher education itself shapes digital technologies. For instance, the specificities of the local higher education system have led to readjustments in transnational technical standards; organisational narratives on the digital have participated to its infrastructuring; users have engaged and experimented heterogeneously with digital technologies.

Rather than the passive object of digital technologies, higher education thus appears as a component of a mutual structuring process in which heterogeneous actors – teachers, students, administrative staff, governance, policy-makers, and many others – co-construct technologies for education.

The trajectorist rhetoric of linearity (Appadurai, 2013) does not seem sufficient. It is indeed fraught with perils, as it can obfuscate clashes, conflicts, silences, and invisibilities. More sophisticated understandings are needed to empirically grasp what is happening in higher education today. It seems necessary to abandon the dream of linearity now in decision-making in order to recognise and accept the complex relation between digital technologies and higher education.

Reassembling ecological futures for higher education

One last broad theme can be illuminated by following the ideas and processes revolving around interoperability. Interoperability has emerged as a powerful and ongoing connectedness-in-action through which scales (institutional, national, global) and actors (human and non-human, inscribed with different goals and values) are interconnected, and a sociotechnical texture is woven that holds together the organising of local higher education institutions.

However, challenges of various kinds emerge in higher education when its processes and practices are locked into rationalist, compartmentalising, mechanistic visions. Hyper-bureaucratisation and the (neoliberalist) attachment to efficiency are then privileged in organisations over the construction of students as subjects with critical capacity.

Rather, the future of higher education can be ecological. By this, I mean that higher education is now a complex texture knotted together with endless and constantly moving threads whose boundaries – local/global, public/private, actor/network, etc. – are less and less analytically recognisable, and whose entities are increasingly heterogeneous. No separate things really exist, then; rather, diverse ways of separating them can be found in all spheres of social life. Hence, human actors who populate higher education can and should look at relations rather than unconnections; and to the whole (which they, whether willingly or not, co-create), rather than (their own's) part. Hence, I have tried to show how humans and non-humans interconnect and how, in doing so, they (re)produce stories, (re)build worlds and stay in uncertainty.

In this sense, higher education can thrive if its actors recast their vision and, as the anthropologist Tim Ingold argued, perform relational thinking (1999). It shall be a matter of accepting that we, as humans, are no more capable of looking from the sidelines than any other creature of any other kind, and that, like them, we participate with our whole being in the continuum of life.

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