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Digital federalism: balancing automation, authority, and autonomy

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Federalism is about shared sovereignty. Like all social processes, it needs to be tested, revised, negotiated, and even changed according to the problem or decision at hand. In this issue of *Itinera* we argue that diverse and disparate processes of digitization have proved a good testing ground for federalism's many faces, as well as its strengths and weaknesses. By publishing a good handful of investigations in chronological sequence, we attempt to explain and understand federalism as a process, and thus as a historical subject.

For decades, digital technology has been seen equally as a powerful tool, a promise of progress unkept, and as «dumb» technology.[1] Digital technology requires coordination, as evidenced by the many terms typical for the field of computing that sound straightforwardly political. Indeed, sometimes these words – e.g., *protocol*, *center*, *network*, and *control* – do denote political and administrative matters. In Swiss federalism, implementing computing technology entailed the passing on of tasks to the next higher level according to the principles of subsidiarity and solidarity. Digital technology and automation of processes thus paved the way for coordination, but not in the sense of a basic menu of technology services. This is a general finding that emerged from the historical investigations behind the papers collected here. Whether the subject is the federal government's first computer, automated processing of punched cards, digital telecommunications, or supercomputers – digital

1 These observations are widely shared by studies on the history and philosophy of the computer as a universal machine – a machine that is conceptualized and materialized in diverse applications and narratives. See Michael Mahoney's seminal paper titled «The Histories of Computing(s)», first published in Interdisciplinary Science Reviews, 2005, 2: 119–135. Scholars emphasize the relevance of historical criticism in computing given that protagonists of computer development and digital technology produce their own models of historical development. Such models employ, for example, linear concepts of progress that are insufficiently complex for understanding historical change and social innovation. See, for instance, David Gugerli and Daniela Zetti, Computer History. The Pitfalls of Past Futures, Preprints zur Kulturgeschichte der Technik, 2019 (33).

technology and automation never provided coordination or balance per se; rather, they stimulated and even demanded it.

The automation and digitization of Swiss technology and society required substantial cooperation in terms of deploying and balancing political, economic, and human resources among the various actors involved.[2] As such, it posed practical challenges. But these same challenges also brought out the qualities and dynamism of federal systems. The development of digital technology opened up new fields of federal policymaking. In other words, while computing and networks put federalism to the test, federalism in turn exploited digital technologies as a demonstration of its qualities.

When reading the historical accounts of the protagonists who appear in this issue, readers may note that digital federalism has long been characterized by a constant need to balance three complementary elements: automation, authority, and autonomy. Indeed, in all the accounts collected in this issue, autonomy and authority are negotiated in order to reach a certain degree of automation within different social and material spaces. These spaces and places include administrative offices, scientific centers, and federal borders.

The fraught relationship between humans and machines is at the core of a discourse on automation that can be traced back to the 19th century's mechanization of work and today is found in the hopes and fears evolving

2 Historical studies on Swiss public and private projects of automation, computerization, and digitization have appeared since the early 21st century. Museum for Communication (ed.), Loading History. Computergeschichte(n) aus der Schweiz = Loading History. Chronique(s) de l'informatique en Suisse, Bern 2001. See also traverse 2009/3: Gesteuerte Gesellschaft / Orienter la société, www.revue-traverse.ch/ausgabe/2009/3/gesteuerte-gesellschaft (30/3/2021); several issues of Preprints zur Kulturgeschichte der Technik, https://www.tg.ethz.ch/produkte/preprints/ (30/3/2021) and of the book series Geschichte und Informatik – Histoire et Informatique, www.chronos-verlag.ch/reihen/2274 (30/3/2021). Peter Haber and Jan Hodel, Informatisierung / Informatisation / Informatizzazione, in: Historisches Lexikon der Schweiz, 2019, https://hls-dhs-dss.ch/de/articles/013724/2019-07-12/ (30/3/2021). For vivid accounts of the so-called liberalization of Swiss telecommunications, see www.oralhistory-pttarchiv.ch (20/8/2021).

around the social impact of the use of algorithms and artificial intelligence.[3] In the history of federalism since the 1950s, automation – both as a concept and a common goal – usually precedes the realization and spread of digital media and infrastructure. In most cases the (alleged) advantages of automated processes, whether promised by computers or digital networks, have an immediate impact on national, regional, and local policies even before the supporting technologies and infrastructure are in place. Words such as *optimization*, *simplification*, *modesty*, and *coordination* go hand in hand with the idea of automating human and organizational practices by means of technological innovation. Yet they don't automatically represent social or political innovation. This is another result of the research gathered here. The engineering projects analyzed in this issue succeeded in establishing digital federalism much more than in imposing rationalization or optimization.[4] In the 20th century, automation became a peculiar feature of federalism. It was repeatedly employed as a counterweight to achieve the desired balance between autonomy and authority.

Historical research has long since shown that federalism is no one-size-fits-all formula to be applied within a fixed regulatory political and cultural system. The *Historisches Lexikon der Schweiz* (*Dictionnaire Historique de la Suisse – Dizionario Storico della Svizzera*) states that «no single definition of

3 On the transformation of modern statehood and law facing the perils of industrial mechanization, see François Ewald, L'Etat providence, Paris 1986. Jon Agar studied how 19th-century experts attempted to control the UK administration thanks to the deployment of machines: The Government Machine: A Revolutionary History of the Computer, Baltimore 2003. For a classic study investigating the collective career of corporate IT personnel, see Thomas Haigh's Inventing Information Systems: The Systems Men and the Computer, 1950–1968, in: Business History Review, 2001, Special Issue 1: 15–61.

4 These results generally confirm older cultural studies on the relationship between society, science, and technology, which take into account the manifold relationships between human and non-human actors. In particular, the results affirm relational approaches used by humanity scholars in order to make digitized sociotechnical systems accessible to professional and regulatory actors, *and* for public discourse and civic participation. See, for example, Marc Coeckelbergh, Artificial Intelligence, Responsibility Attribution, and a Relational Justification of Explainability, in: Science and Engineering Ethics, 2020, 4: 2051–2068.

federalism is possible».[5] The contributions in this issue show that autonomy and authority were politically and socially relevant throughout the period under investigation. Moreover, the two concepts characterize digital federalism's complex practices of negotiation. Autonomy and authority are closely related to each other. On the one hand, autonomy demands authority at the local and regional level. An example is when cantonal governments or universities make economic or political decisions based on their right to choose what is best for their own sociotechnical and cultural environment.[6] Conversely, in some cases authority bypasses local autonomy. Such is the case, for instance, when the federal government makes decisions on «overarching» projects that concern the country as a whole, with the consequent deployment of human and economic resources that no autonomous regional or local actor can afford.

Federalism is not synonymous with the nation-state. It can be practiced within and across states. The collection in this issue thus supplements accounts of the history of digital technologies and media from national, international, and transnational perspectives that have arisen within fields such as media studies, Internet studies, the history and philosophy of technology, computer history, and science and technology studies.[7] By collecting for the

5 Rainer J. Schweizer and Ulrich Zelger, Föderalismus / fédéralisme / federalismo, in: Historisches Lexikon der Schweiz, 2019, https://hls-dhs-dss.ch/de/articles/046249/2009-11-05/ (30/3/2021). For a concise history of federalism, see Dieter Langewiesche's take on «another German history». Langewiesche traces the history of German federalism from medieval times up to the present and «from a multi-state empire to a federal state». Dieter Langewiesche, Vom vielstaatlichen Reich zum föderativen Bundesstaat. Eine andere deutsche Geschichte, Stuttgart 2020. For an overview of the often, yet not exclusively national connotations of the term *digital sovereignty*, see Stéphane Couture and Sophie Toupin, What Does the Notion of «Sovereignty» Mean When Referring to the Digital?, in: New Media & Society, 2019, 10: 2305–2322.

6 The federal state has its own autonomy too. For a comparison of Swiss and German federalism, see Dietmar Braun, Dezentraler und unitarischer Föderalismus. Die Schweiz und Deutschland im Vergleich, in: Swiss Political Science Review, 2003, 9: 57–89.

7 Much of this research has been published as monographs or in academic journals, usually focusing on single case studies covering a short time span. An exhaustive list of all the contributions dealing with national case studies on digitization would be too long. However, in addition to several efforts from the United States, readers might wish to con-

first time studies that reflect on digital federalism in the 20th century, this issue also represents a first attempt to put several cases in chronological order and to consider them by comparing and relating them to each other. Chronology and narration reveal the power of historiography to challenge what seems to be obvious. Individual and collective learning is based on reflection. It is reflection that makes information, like a historical work, valuable.

The first two papers in this issue deal with the relationship between and among states, information, and computers. The papers emphasize the long and varied history of information in state administration and the momentous consequences of technological visions. As early as the 1950s, Swiss federalism was addressed by governmental and administrative actors with the help of computer technology. Since then, implementing digital technology – in public sector administration for education and research purposes, in emerging sociopolitical and economic regions of Europe, and in global communities – implies activating and even innovating federal mechanisms that are anything but purely technical. All the steps along the way toward digital federalism – whether dreams or expectations, automation, cooperation, or conflict – are moreover embedded in a longer history that reflects a balance of forces, resources, and responsibilities that was constantly shifting among the various actors. The two articles in the middle of the issue investigate federal negotiations in the fields of migration and university policy. These articles emphasize how, in the second half of the 20th century, federalism was closely linked to the development of the welfare state, its economic and cultural resources, and its challenges. The last two papers deal with supercomputing, a prominent phenomenon of recent national and transnational history. The papers show how, by the end of the 20th century, the nation-state and

sult the following studies: Gregory Asmolov and Polina Kolozaridi, Run Runet Runaway: The Transformation of the Russian Internet as a Cultural-Historical Object, in: The Palgrave Handbook of Digital Russia Studies, Cham 2021; Paolo Bory, Gianluigi Negro, et al. (eds.), Computer Network Histories. Hidden Streams from the Internet Past, Zurich 2019; Gerard Goggin and Mark McLelland (eds.), The Routledge Companion to Global Internet Histories, New York 2017; Gianluigi Negro, Internet in China, London 2018; Valérie Schafer and Benjamin Thierry, Le Minitel: l'enfance numérique de la France, Paris 2012.

the very meaning of the computer were being challenged by the unprecedented «super» scale of the social and political coordination required by high-performance computing.

The first paper by Laura Skouvig shows that the relationship between state, information, and technology has been close for centuries. For this very reason, it is important to point out that the concept of the information state implies an ever-changing constellation of new technologies, different forms of information, and statehoods. Skouvig makes the case that the close nexus observable in digital societies is not new at all. Historiography has long maintained that different states had different reasons for collecting different forms of information in different ways. That is why her paper occupies the opening pages of this special issue. Based on an extensive body of research on the history of information, Skouvig argues that historiography has the power to challenge narratives that treat information as a naturalized entity. She shows that in the second half of the 20th century, a very popular concept arose that was rooted in communication theory and engineering and that saw information as quantifiable.

What is the quality of information? Why do states use technology? And why do they collect information? These questions are the most relevant because according to Skouvig current «[v]iews on quantity lead to determinist understanding of the information society», which evens out differences in attitudes toward information:

> Although the information state as an analytical concept has a tendency to focus on technologies in the form of death certificates, other printed forms, or the census, it raises questions about the underlying reasons and ideas for collecting information and for using particular technologies.

Information approaches ideology when neither civil servants nor learned scholars question its quality, to name just two categories of actors who have been custodians of information for centuries.

Nick Schwery's paper provides a first essential hint of the balance between authority and autonomy by approaching the arrival of the computer through the lens of information as well as of organization management in Switzerland. In reading Schwery's paper on the coordinating role of the Swiss Central Office for Organizational Affairs between the 1950s and the

early 1960s, we noticed that more than being just a matter of content or data management during this period, information was first and foremost about organization. In fact, in the initial steps toward Swiss digital federalism, the computer appeared «on the horizon» as a key tool not only for managing the quantity of information and data, but especially as a technology adept at shaping the human, physical, and technical organization of the federal administration.

Schwery reflects on the many authorities involved in the automation process:

> [T]he computer became a vehicle for self-reflection, and subsequently a way to change the administration and the way it did its work under the radar of politics. The cooperation between highly heterogeneous institutions and actors stood at odds with the line organization.

As Schwery argues, the prospect of the computer changed the Confederation's administration, even before the actual arrival of the machines. Computing challenged the borders between the administration and the political sphere or, in other words, between autonomy and authority, opening up a whole new space of negotiation between different institutions and political actors. In Schwery's words, after a preliminary phase of coordination in the 1950s, by 1960 the negotiation ground for the future use of computers was defined «[n]ot in response to the computer, but anticipating computer use and computer access from a holistic standpoint. Not as an answer to the growth of the administration, *but in the context of it*» (emphasis added).

Once the computer entered the federal administration, the demand for automated decisions and standardized digital practices from Swiss institutions, offices, and organizations shot up. In this respect, Moritz Mähr's paper takes a step forward, both chronologically and pragmatically, toward attempts to implement federalism using digital means. Mähr takes a look at migration, one of the first core applications of computers for Swiss policy-making. In the 1960s the promise of automation informed the federal principle of distributing external human resources (but also burdens) throughout the country.

As Mähr points out:

> [B]etween 1967 and 1969 a solution was found which was also viable for the cantons. Not much remained of the visionary claim to automate migration policy. The information system was to replace the existing statistics without major adjustments in the cantons and municipalities. [...] The demand for radical control of migration flows had given way to the federal reality in which cantons and the federal administration negotiated a compromise.

The troubled path between 1964 and 1971 that led to the (partial) automation of the Central Aliens Register (ZAR) is a wonderful historical example of the constant negotiation between cantonal and federal institutions – in this case between the Federal Council, the Aliens Police, and the cantonal authorities. But Mähr's account does not dwell only on power relationships. It also shows how digitization challenged the heterogeneity of Swiss cantons in terms of work and organizational habits, social practices, material (and analog) tools, and methods of controlling migration. A clear example of the impact of automation on the material and sociotechnical dimensions of federalism is, in fact, analog technologies, such as the different paper forms designed and used by cantonal authorities on «the front line» – i.e., on national borders – which had to be standardized in order to be processed by a centralized computing facility. In the history of ZAR, these analog forms acted as brokering objects. They were the «material» of a complex negotiation between autonomy, automation, and authority, and as such between the federal administration and the Aliens Police or, in brief, between (federal) «offices» and (cantonal) «officers».

It is worth noting that although the first two case studies analyzed in this issue deal with different forms of sociotechnical networks, they do not involve digital networks. In other words, at an early stage of digital federalism, analog and digital means of communication and information processing coexisted. For example, in Mähr's account, migration forms and the statistical results output by computers were shared between cantonal and federal authorities by post.

The paper by Daniela Zetti is the first study in this issue to examine digital networks. It deals with the premises and special measures behind the scientific network known as SWITCH. At first glance, the essay seems to track a technological leap that took place between the early 1970s and the

late 1980s, bringing readers into the age of digital telecommunications and networks. But most of Zetti's analysis refers to the late 1970s, shedding light on the negotiation of decision-making power and science policy between the Swiss universities and the federal state during this period. Zetti looks beyond the technological advancements embedded in the SWITCH network to the historical processes behind the federal dispatch of 1985 announcing «special measures in favor of education and further training as well as research in information technology and engineering sciences».[8] Contrary to other, enthusiastic accounts of national networking projects, and rather than focus on the «novelty» of the network – which, incidentally, was not new at all – Zetti chose instead to trace cooperative federalism in the lead-up to the federal «special measures» that gave rise to SWITCH. As Zetti puts it:

> The future SWITCH computer network and its supporting organization, the SWITCH Foundation, were innovative, and hence constituted special measures relating to university policy that relied on institutions and helped to establish rules and boards for discussion and decision-making. [...] With regard to the intended effects of the special measures – education, training, and managing structural change – the network most likely performed poorly or at least in a way that cannot be measured. [...] The positive societal impact is to be found somewhere else.

The «somewhere else» is again traceable in the political, economic, and cultural arena, where the federal state, universities, and computer scientists negotiated their respective claims on autonomy, authority, and automation. Zetti explores the potential of the dual nature of the network, in its «ideal and material form», looking at SWITCH as a point of departure rather than a terminus for historical investigation. This material and ideal form is discernable in several traits of the Swiss scientific and political system of the 1970s: the heterogeneity of the network «nodes», which represented different hardware and user practices at each university; the Swiss science institutions' claim of autonomy from the «special measures» that were eroding the universities' power to decide funding for educational and technological assets; and even the question of whether the upcoming networking projects

8 Swiss Federal Gazette.

were consistent with the principle of «frugality» peculiar to the Swiss federalist vision.

Returning to Laura Skouvig's plea for turning a historical gaze on «the quality of information», Zetti shows how the network was not just a simple technological solution for managing information. Rather, it constituted the enactment of the federalist hope and principles revolving around cooperation and planning efforts.

In line with this narrative, the last two contributions, which deal with supercomputing projects in Germany and Switzerland, respectively, probably represent the highest level of cooperation and balance between institutional and economic forces in digital federalism. Supercomputing is not discreet. In fact, it is conspicuous, state David Gugerli and Ricky Wichum at the outset of their paper. Supercomputing and nation-states have a special relationship, because supercomputing

> means the allocation of an extreme amount of resources in a single and very complex computing center. [...] Hence, supercomputing has always been a playground for powerful, splendid governments and their technoscientific programs.

Gugerli and Wichum proceed to show – contrary to this first and obvious relationship between supercomputing and central power – how a new kind of federalism emerged in the field of supercomputing. The subject of their study is the Center for High Performance Computing in Stuttgart, southern Germany. The early phases of German digital federalism in supercomputing were characterized by attempts to distribute resources and later by regional competitiveness. In a third phase, which began in the second half of the 1990s, a qualitatively new form of federalism emerged. Gugerli and Wichum speak of «a regime in which a broad variety of actors and programs participated» that could not be related to any «predefined model and no organizational standard for supercomputing». The new form continues to adhere to this characteristic: it is constructed in «trading zones» to create local configurations of supercomputing. And even here, there is no local *spiritus rector*, but rather «strong alliances, carefully designed forms of autonomy, and selective interrupts for the control of desired and disruptive interdependence.»

The final contribution is by Paolo Bory, Ely Lüthi, and Gabriele Balbi, who provide an impressive example of how balance can be created through

negotiations among unequal partners. Their study deals with the founding of a national supercomputing center in Switzerland promoted by ETH Zurich and the canton of Ticino. Ticino had no university in the 1980s, but nevertheless it was chosen as a site for national supercomputing.

The Swiss National Supercomputing Center (CSCS) took shape in an advanced computing landscape at Swiss universities. Academic digital Switzerland already existed, brought with it its own traditions, was growing stably, and was well connected internationally. By including the installation of a supercomputer in the package of special measures, the federal government acquired the political authority to manage the new scientific field of supercomputing and to institutionalize it through a center. The federal government was able to do this because of the availability of scientific, administrative and technical expertise at the federal level. Thus, the federal government delegated supercomputing within the federal sphere to the ETH Board[9] and to one of its two federal institutes of technology, ETH Zurich. Both with respect to the digital-state technosphere, with its strong emphasis on higher education, and the routines of the federal organizations, continuities are evident in Swiss supercomputing.

The decision to bring supercomputing to the southern part of Switzerland promised to extend the Swiss digital landscape in a most spectacular way. But supercomputing strained the institutional fabric of federalism to a surprising degree. The organizational form of the center was immediately visible and became a surface on which to project exotic visions and cooperative schemes of unlimited scope. National supercomputing in Ticino demonstrated that federal politics was alive, but in need of grand visions, especially at the supra-regional and international level. Moreover, federalism requires solidarity, as the authors point out:

> Tensions aside, CSCS was also an act of «solidarity» with Ticino. Solidarity is a key principle in any federal association as it entails the faith (from the Latin *fede*) of those allies, whether states or cantons, who tend to support each other in order to strengthen (to make more *solid*) the cohesion and development of the entire nation.

9 The ETH Board is the supervisory body for Switzerland's two federal institutes of technology and four federal research institutes.

The article by Bory, Lüthi, and Balbi elucidates a fragment of contemporary history from the late 20th century because it shows how the cohesion between societies in the digital era is «handmade». Cohesion needs networkers. Much local work was needed to expand digital federalism, and many actors from a wide variety of social, economic, and political backgrounds were involved in constructing the center. Supercomputing in Ticino rapidly acquired fame beyond the region's borders. Accordingly, the supercomputing center demanded more solidarity from its management in faraway Zurich than initially anticipated. In the meantime, the center's location was a scandal of such proportions that, even at the time, Council of States member Giuseppe Buffi insisted its «history [...] must be written down».

A common thread links all the papers in this issue, namely, the co-development of a digital society and federalism in the second half of the 20th century relied on a common agreement to secure the balance of automation, authority, and autonomy. Such history shows how the prosperity of federalism depends on a continuous and complex sociotechnical investment in institutions, information, and infrastructure to keep up with the times.