FUTURE LAW
WORKING PAPERS 2023 • 2

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Reframing Political Power in the Digital Constellation: Taking Technopolitics Seriously

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Reframing Political Power in the Digital Constellation: Taking Technopolitics Seriously

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1. Abstract

The development of new technologies brings with it "technical superiority", but new technologies can also be a stress test for existing political systems, which may fail as a result, leading to cascading effects that threaten fundamental precepts of democratic societies and their key institutions. If policymakers fail to recognise these challenges, the damage could be massive and human development could be drastically curtailed. The problem, then, is that technological means and their demands on political systems may not be sufficiently understood. Today, the close connection between technological and human development necessitates an eco-systematic approach: technopolitics is based on the interaction and mutual dependency of the dominions of technology and politics – and the normative responses to navigate their interaction. Technological developments and their use make it possible to impact political constellations across the world and have emerged as arenas of political conflicts on a system level. Technopolitics, based on Mayer et.al., is introduced and further conceptualised in this article to capture this phenomenon – and normative responses to it. The article highlights essential developments that underpin the concept. It shows cases how power plays in the role at each stage of development of the technologies of societal interaction, including in early phases like design and standardisation. Just as law is code, tech is power. Technological innovation therefore needs to be politically and normatively framed.

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Biographies

Astrid Bötticher received her Diplom in Political Science, with a minor in Education Science, from the University of Hamburg in 2008. Her thesis was in the field of Government Studies and compared old and new right-wing ideologies. During her studies and afterwards, she participated in the "Arbeitskreis Kriegsursachenforschung" (AKUF) at the University of Hamburg. In 2017, she received her PhD from Leiden University, Netherlands. Her dissertation focused on the conceptualization and differentiation of the controversial terms "radicalism" and "extremism" in the German discourse. She was supervised by Alex P. Schmid and Edwin Bakker from the Faculty of Global Affairs and the Institute for Security and Global Affairs. She is currently a Research Fellow and head of the Quantum Humanities Network at IQEL-Innsbruck, where she develops conferences, workshops, and summer schools, and conducts government consultations. She also works as a PostDoc at the University of Jena on various projects related to digital freedom and geographic information systems and where she researched societal processes related to the development of quantum computers. She has participated in several mentoring programs and is the founder and director of the Quantum Humanities Network, a Europe-wide network dedicated to researching and utilizing second-wave quantum technology. She is also a member of the European Expert Network on Terrorism Issues, organized by the German Federal Criminal Police Office, and the Gesprächskreis Nachrichtendienste (GKND e.V.). Astrid has organized several conferences, including the Security in the Quantum Age Conference 2022 at the University of Jena. She was responsible for its development, planning, organization, and leadership, and was joined by renowned experts in the field, including Robert Axmann, Manfred Lochter, Falk Eilenberger, and Adrian Marotzke. Bötticher is also a freelance lecturer in sociology and political science at the Berlin School of Economics and Law, where she has taught from April 2017 to

March 2019. Additionally, she teaches in the field of cybercriminology at the University of Applied Sciences for Police and Public Administration in Berlin and Brandenburg. With her broad experience in academia and industry, Bötticher is a sought-after expert in the field of quantum computing and its social implications.

Anastasija Nikiforova (PhD in Computer Science – Data Processing Systems and Data Networking) is an assistant professor of Information Systems at University of Tartu (Faculty of Science and Technology, Institute of Computer Science, Chair of Software Engineering), and a part of European Open Science Cloud Task Force "FAIR Metrics and Data Quality". Her research interests are related to data management, focusing on data quality and data integration issues, public services, open data and open government data (OGD) related subtopics, covering both technological and societal aspects of OGD and OGD portals. This includes both, OGD in the context of Society 5.0, SDG, smart city etc. studies on the one hand and diverse HCI-related topics on the second hand. The latter is also closely related to the digitization and sociotechnical advances, which, however, is not limited to the above scope. She is an expert of the COST – European Cooperation in Science & Technology, as well as Latvian Council of Sciences in (1) Natural Sciences – Computer Science and Informatics, (2) Engineering and Technology-Electrical Engineering, Electronics, Information and Communication Technologies (ICT), and (3) Social Sciences – Economics and Business. She serves as a program committee for several international conferences (20+) and invited reviewer for 15+ high-quality (Q1-Q2) journals. She is an Editorial Board Member and an Associate Editor for several journals (BMC Research Notes (Springer Nature), eJournal of eDemocracy and Open Government (JeDEM), Data & Policy (Cambridge Press), International Journal on Semantic Web and Information Systems (IJSWIS) (IGI Global), Politics of Technology section of Frontiers in Political Science etc.). She is also an associate member of the Latvian Open Technology Association and an EDSC ambassador (European Digital Skills Certificate, as part of Action 9 of the Digital Education Action Plan (2021- 2027) – JRC/SVQ/2022/OP/0013). Her previous experience

includes the role of a visiting researcher at Delft University of Technology, Faculty of Technology, Policy and Management, an assistant professor at the Faculty of Computing and researcher in the Innovation Laboratory of University of Latvia, and IT-expert at the Latvian Biomedical Research and Study Centre, BBMRI-ERIC Latvian National Node, where she was involved in six ERDF and Horizon 2020 projects with a focus on data management and software engineering. She also acted as an advisor for the Institute for Social and Political Studies (University of Latvia).

Prof. Dr. Johannes Ruhland is a renowned expert in business administration and information technology. He is currently the Chair of Business Administration and Information Systems at Friedrich-Schiller-Universität Jena, a position he has held since 1994. Prior to this, he was a professor at the University of the Bundeswehr in Munich and played a key role in establishing the Chair of Information Systems at Friedrich-Schiller-Universität Jena. Prof. Ruhland has published extensively on various topics related to business administration and information technology as well as strategic planning. He has authored several book chapters and articles in prestigious journals, including a recent paper on opinion power and diversity of opinion in traditional and modern information intermediaries. Prof. Ruhland received his doctoral degree in business administration in 1984 and completed his studies in business administration, mathematics, and physics at the Ludwig-Maximilians-Universität München between 1974 and 1980.

Prof. Matthias C. Kettemann is a University Professor of Innovation, Theory, and Philosophy of Law at the Institute for Theory and Future of Law. He received his law degrees from Graz and Geneva universities and was a Fulbright and Boas Fellow at Harvard Law School, where he completed his LL.M. degree. He obtained his Ph.D. from the University of Graz, focusing on the legal position of individuals in international law under the guidance of

Prof. Benedek. Prof. Kettemann was called to work as a postdoctoral fellow at the Cluster of Excellence "The Formation of Normative Orders" at Goethe University Frankfurt in 2014, where he received his habilitation in 2018 with a thesis on the normative order of the internet and was granted the teaching qualification in public international law, internet law, and legal theory. He held several teaching positions at universities across Germany, including Ruprecht-Karls-University Heidelberg, Friedrich-Schiller-University Jena, and Goethe University Frankfurt. Prof. Kettemann is currently a research program leader at the Leibniz Institute for Media Research | Hans-Bredow-Institute, Hamburg; research group leader of "Global Constitutionalism and the Internet" and head of the research project "International Law of the Internet" at the Alexander von Humboldt Institute for Internet and Society, Berlin; head of section "International Law and the Internet" at the Max Planck Institute for Comparative Public Law and International Law, and board member and research group leader of "Platform and Content Governance" at the Sustainable Computing Lab, Vienna University of Economics and Business. Prof. Kettemann's research focuses on national, European, and international internet law; the regulatory aspects of governance for complex processes, particularly in relation to digitization and artificial intelligence; multilevel governance, particularly platform governance and state regulation of private spaces; international law of the internet and internet governance; innovation law, technology assessment, and future justice; legal theory and philosophy, particularly internet law theory; media law, media change, and media regulation. Prof. Kettemann has also served as a reviewer for several publishing houses and as an expert for various national and international institutions, including the UN ECLAC, OSCE, African Union Commission, and the EU Fundamental Rights Agency (FRANET).

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2. Introducing loose ends

We are in the midst of a technology-driven transformation, driven in particular by radical innovations in intelligent machines and a knowledge economy, coupled with a dependent political landscape. Technology-driven changes, such as the platform economy or social networks, artificial intelligence, and generative AI in particular such as ChatGPT, and the associated success of the data economy, have also led to changes in everyday behaviour and organisation of society.[1] Technical innovations lead to the development of new technical functional systems, increase functional interdependence and interact with the formation of political order. We see a dissemination of innovation that come with a political purpose and developments are being driven forward at an ever-increasing pace. Of course, machines are created within a society that interacts with them (i.e., human-computer interaction discipline) and in which they are developed. We are facing a process in which both parts are interdependent.

The knowledge economy alone had brought changes that have come into realization now into our everyday lives and have changed the way society is organised dramatically. Peter Drucker has explained the major shifts that have taken place in the development of the knowledge industry at its early stages. First, new technologies have emerged, leading to the development of major new industries. Second, there has been a shift from an international economy to a world economy. Third, pluralistic institutions have created a new socio-political reality that poses significant political, philosophical. Finally, the new universe of knowledge based on mass education has implications for work, leisure and leadership.[2] Soon after this, the OECD has acknowledged the concept of a knowledge economy and connected it from its start with technology, stating that:

"The term 'knowledge-based economy' results from a fuller recognition of the role of knowledge and technology in economic growth."[3]

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[1] 2011. Castells, M.: The rise of the network society: The information age: Economy, society, and culture (Vol. 1). New York: Wiley.

[2] 1992. Drucker, P. : *The age of discontinuity: guidelines to our changing society*. 2nd.Ed., New York: Harper & Row.

[3] 1996. OECD: *The knowledge based economy*. Paris: OECD. https://one.oecd.org/document/OCDE/GD(96)102/en/pdf P. 9.

The OECD recognised early on that the advent of information technology had brought about a remarkable change in the way we organise our work and would change the workforce and its skills.[4] The European Union has linked the development of digi-tech to the "fourth industrial revolution", a concept that links digitalisation to the value chain and saw the possibilities to enhance interaction between citizens and governments.[5] It also follows the idea of a knowledge-based economy by investing heavily in long-term research to develop future technology, which is seen as a factor in future markets and progress. [6]

But it has not led only to a change within social practices but to a remarkable change in the way, how power politics is played now.[7]

Therefore, the regulatory implications of new technologies are becoming increasingly important, and the way technology is disseminated has the potential to enhance or disrupt political systems and their societies and institutions. The influence of technology and policy is circular. On the one hand, this points to the political favouring of technical developments, and on the other hand, it points to the significance of technical developments for political action. Following Werner Rammert's criticism of sociology's distance from technology as early as 1982[8], International Relations has incorporated objects into its theorising, as shown by Mayer et al.'s conceptualisation of "technopolitics ".[9] We see that the politically targeted dissemination of technical goods is an investment into power politics today.

[4] 1996. OECD. Ibid. P. 13-14.

[5] The Fourth Industrial Revolution | Digital Single Market (archive-it.org) 27.03.2023.

[6] Emerging Technologies | Digital Single Market (archive-it.org) 27.03.2023.

[7] Barbara Lippert, Barbara, Perthes, Volker (Ed.): Strategische Rivalität zwischen USA und China. SWP Berlin 2020. Strategische Rivalität zwischen USA und China. Worum es geht, was es für Europa (und andere) bedeutet (swp-berlin.org)

[8] Rammert, Werner (1982): Soziotechnische Evolution – Sozialer Wandel und Strategien

[9] Mayer, M., Carpes, M., Knoblich, R. (Eds). (2014): International Relations and the Global Politics of Science and Technology: Vol. 1 - Approaches, Concepts and Interdisciplinary. Berlin, Heidelberg. Springer.

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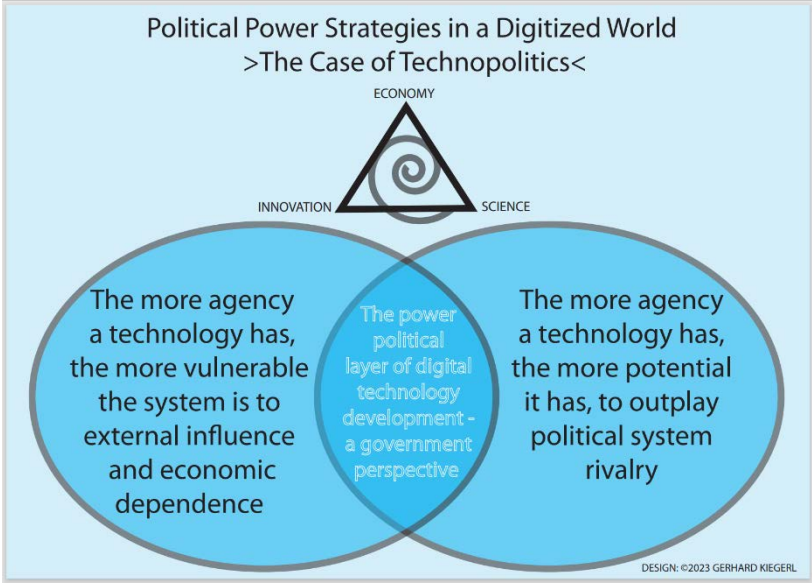

Figure 1: Political Power Strategies in a Digitized World – the Case of Technopolitics. Astrid Bötticher. Design: Gerhard Kiegerl.

In order to understand what has led us there, there are certain developments or underlying features and tendencies that need to be taken into account. Two things have changed that should be taken into account to explain what technopolitics is, how we got there and, on that basis, how we can understand what kind of strategies governments use to use technopolitics as a power play strategy and how they try to counteract the technopolitical measures of system rivals.

Research and innovation subsequently lead to technological performance and point to market development and/or stabilisation, which became an important precondition for policy.[10] The knowledge-based economy is the basis for the development of an information society.[11] The development and dissemination of digital networks has

[10] Mayntz, R.: Grosse technische Systeme und ihre Gesellschaftstheoretische Bedeutung. *Kölner Zeitschrift für Soziologie und Sozialpsychologie.* 45 (1) 97-108 (1993). P.104.

[11] Becla, A. (2012): Information society and knowledge-based economy–development level and the main barriers–some remarks. *Economics & Sociology*, *5*(1), 125-132. See also: European Commission: Einheit Europas, Solidarität der Völker, Vielfalt der Regionen - Zweiter Bericht über den wirtschaftlichen und sozialen Zusammenhalt. Report. 31.01.2001. https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/p147_de.pdf. Last access:

subsequently led to knowledge-networks[12] and ultimately to a networked society, in which decision-making processes have been re-organised from a top to bottom approach to a network approach.[13] This has triggered the increase of popularity of co-creation processes, where both representatives of one stakeholder group (e.g. business, government or citizens) can take part in, or different groups of stakeholders collaborate.

This information society also known as Society 4.0 is intimately linked to a globalised knowledge economy, where innovations can be disseminated around the world, but the machines and devices we create have become increasingly intelligent, and at the same time have taken on an agency of their own. This is also one of the reasons for the current for transformation of the current form of society into Society 5.0 also known as super smart society or society of imagination, where these artefacts, i.e. machines and devices, serve for people and their needs. The relationship between technology and society is not enigmatic, but situational and embedded in human action. There is a structural relationship in which technology has agency without being an agent, and is managed through the design of institutions, the development of infrastructure and the dissemination of technological knowledge. The development and use of technology has a situational component, and the innovation process itself is influenced by cultural practices.[14] And this is related to our understanding of how some of our institutions have changed, such as the law, as it has developed an understanding of normative order as 'hard law' and 'soft law', and with the development of soft law, an understanding of technology design as normative order, as it can support ideologies. Regulation becomes a relational pattern.[15] Here, soft law is understood as a set of norms that are not enforceable by a central authority, but are enforced by technology or by private rulers of

25.02.2022. See also: Żelazny, R. (2015). Information society and knowledge economy–essence and key relationships. *Journal of Economics & Management*, *20*, 5-22.

[12] 2005. Archibugi, D., & Coco, A.: Is Europe becoming the most dynamic knowledge economy in the world? Journal of Common Market Studies, 43(3), P. 433–459. See also: https://one.oecd.org/document/OCDE/GD(96)102/en/pdf P. 14. Last access: 27.03.2023.

[13] 2010. Castells, Manuel: The Rise of the Network Society. 2nd ed. Madden, Oxford, West Sussex. Blackwell Publishing Ltd. P. 28-76.

[14] Bötticher, A., Seskir, Z.C., Ruhland, J.: Introducing a Research Program for Quantum Humanities: Theoretical Implications. arXiv:2212.12947

[15] 1985. Burawoy M: The Politics of Production: Factory Regimes Under Capitalism and Socialism. Verso, London. See also: 2015. Mazzucato M.: The entrepreneurial state. Anthem Press, London.

technology. While a hard law is a law that is implemented by the public authorities.[16] The simple truth behind this is that companies govern or regulate their technology space through contracts, rules for users, or by imposing data governance rules and implementing certain algorithms. This means that stakeholders (individuals, companies) have a role to play in public goods such as the stability of the Internet architecture.[17]

As a result, investment in technological development is becoming increasingly important in power struggles, and this includes attention structures.[18] Of course, the development of the digital world is not the only factor influencing these findings. We now know that the development of quantum technology could be a much more powerful development than the development of digital technologies such as artificial intelligence, for instance and this is about post-digitalisation and how a rule system develops.[19]

For policy makers, the results are of great importance and have led to the development of a policy field called innovation policy, which serves as a bracket for the individual policy areas. Important policy areas that flow into this are education policy, science policy and economic policy, but also international relations. An important shift is the recognition that technological development is no longer simply a matter of gaining the upper hand in a conflict, where technical superiority is a precondition for winning individual battles, but that technological development is the basis for the development of life: from the cradle to the grave, we are deeply interwoven with the technology that shapes our lives and whose existence we shape. As a result, policy is increasingly oriented

[16] Kettemann, M.: "Regulate softly, but carry a big normative stick: The role, relationship and potential of soft and hard law in governing platforms" took place on 22 February 2022 as part of the DigiGov Virtual Winter School "Taming the iMonster: Regulating digital platforms". https://youtu.be/aCMmWA02neU. Last access: 27.03.2023.

[17] Guthrie, D. (1999). A Sociological Perspective on the Use of Technology: The Adoption of Internet Technology in U.S. Organizations. Sociological Perspectives, 42(4), 583–603. https://doi.org/10.2307/1389575

[18] European Commission: Einheit Europas, Solidarität der Völker, Vielfalt der Regionen - Zweiter Bericht über den wirtschaftlichen und sozialen Zusammenhalt. Report. 31.01.2001. https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/p143_de.pdf Last Access 20.02.2022.

[19] Farina, Nick: Creating Effective Global Governance of Quantum Computing. World's Top 50 Innovators 2022 @CodexTalks. London, 26-28 September 2022. https://youtu.be/Pom9gy2zSjw

towards the development of innovation systems that are guided by the policies of individual policy areas.

Today, the formation of national innovation systems[20] forms an important backbone for the knowledge economy that has developed alongside digitization. Technology development has become an increasingly important driver of economic prosperity and political power, more so in the knowledge economy and its massive economic and political interdependencies in the age of globalization and digitization.[21] The knowledge economy, which forms the backdrop of these broadly emerging high-tech radical innovations, is based on a form of governance focused on technical development and its economic exploitation, working with orchestrated public investment, guided by evaluated methods of dissemination and diffusion. The development of national innovation systems has progressed. National innovation systems are comparable to a machine and consist of a network of institutions in business and government:

"The system is a mechanism which incorporates inputs and outputs it is predisposed to its transformation, a machine whose internal configuration and organization can assure a variety of functions. The contribution of science and technology to the development and competitiveness of economies appears to be marked by institutional and organisational factors which ought not to be ignored."[22]

Digitisation, the knowledge-based economy and globalisation are central to today's struggle for political power (based on a functioning innovation policy) and the expansion

[20] "A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products. A sectoral system has a knowledge base, technologies, inputs and an existing, emergent and potential demand." Malerba, F. (2002): Sectoral Systems of Innovation. *Research Policy* 31. P. 250. See also: Malerba, F. and Orsenigo, L. (1993): technological regimes and firm behaviour. *Industrial and Corporate Change.* **Vol.2 Nr.1.** p. 45-71.

[21] 2002. "A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products. A sectoral system has a knowledge base, technologies, inputs and an existing, emergent and potential demand." Malerba, F. (2002): Sectoral Systems of Innovation. *Research Policy* 31. P. 250. See also: Malerba, F. and Orsenigo, L. (1993): technological regimes and firm behaviour. *Industrial and Corporate Change.* **Vol.2 Nr.1.** p. 45-71.

[22] 1994. Sanz Menéndez, L., Muñoz, E. (1994): "Technology Policy in Spain: Issues, Concerns and Problems". Published in Aichholzer, G., Schienstock G. (eds.): Technology policy: towards an integration of social and ecological concerns. De Gruyter: Berlin, New York, 1994. Pp.350.

of spheres of influence in international relations.[23] Developments in tech have become a political issue in the international power politics play, that can not be ignored and needs to be conceptualised. The national innovation systems thus become a guarantee for limiting external influences by avoiding or mitigating technological dependencies. At the same time, a tendency can be observed today not only to intervene in processes formerly understood in purely administrative terms, but to establish technical arrangements as a power-political backdoor. Even Schelsky, the great determinist of technology, postulates that technology provides access to the world and that this access to technology enables a new way of relating to the world. He assumed an incremental progression towards what he called technocracy (as distinct from our notion of technopolitics) and did not see a general plan behind the development of technology.[24] However, the shift towards project-oriented science and a growing geo-economy points to an increasing influence of politics on the direction of innovation and to a pre-installed function through the technical design of products, the sales of which can be used in a targeted political way. On the factual dimension, we then find not simply a "best one way", but a kind of performative factual constraint.

Technopolitics has two temporal dimensions: when basic research is done, when prototypes are developed, we find pre-implemented functions and decisions that have led to these functions. The way a technology is designed tells us what is negotiable - and what is not. Industrially mature products and their distribution are the second temporal strand. There is the politically directed distribution of high technology, large-scale technical installations, interactive or transactive systems, which are accompanied by the political concept of striving for great power on the one hand and technical sovereignty on the other, and which can condition a new material dominance.

With the success of today's technological leaps and increasingly intelligent technical systems, but also with the greater understanding in politics today that (large)

[23] 2022. Kniep, R.: Herren der Information. Die transnationale Autonomie digitaler Überwachung. Zeitschrift für Politikwissenschaft, Nr. 32, P. 457–480.

[24] 1961. Helmut Schelsky: Der Mensch in der wissenschaftlichen Zivilisation. In: Der Mensch in der wissenschaftlichen Zivilisation. Arbeitsgemeinschaft für Forschung des Landes Nordrhein-Westfalen, vol 96. VS Verlag für Sozialwissenschaften, Wiesbaden. https://doi.org/10.1007/978-3-663-02159-9_1

technical installations and technological applications can lead to a form of soft influence if they are deliberately used for political purposes, we are facing a transition in international politics that requires further conceptualisation. In this paper technopolitics is developed as a concept along the line of technology distribution and technology usage.[25]

The paper develops the analytical framework, in which technopolitics is defined and described. With technopolitics as concept, it is possible to analyse how power and control turn only seemed to private hands, but new leverages of power become points of political interference. Examples are provided for illustrative purposes to demonstrate this form of political agitation and show the intersections of power in a technopolitical set that will cover the European Union, the United States of America, and the People's Republic of China.

To be able to depict the transformation appropriately, political science has adapted with a new vocabulary and describes the phenomena that are strongly linked to digitization. While the concept Technopolitics has been developed in economy and sociology has its own tradition[26], the International Relations theory has used it to describe a change in the use of markets and targeted sales abroad of digital technology in a framework of political system competition that can be characterized as boundary-pushing.[27]

Technopolitics refers to the intersection of technology and politics, where technological innovation is used as a power strategy by governments and other actors.

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[25] 2021. Schaupp, S. Technopolitics from Below: A Framework for the Analysis of Digital Politics of Production. Nanoethics 15, 71–86. https://doi.org/10.1007/s11569-021-00386-8

[26] 2021. Kellner, D.: Globalization, Technopolitics and Revolution. In: Technology and Democracy: Toward A Critical Theory of Digital Technologies, Technopolitics, and Technocapitalism. Medienkulturen im digitalen Zeitalter. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-31790-4_6. See also: 2016. Kurban, Can, Peña-López,Ismael, Haberer, Maria :What is technopolitics? A conceptual scheme for understanding politics in the digital age. Building a European digital space, P. 499-519. Proceedings of the 12th International Conference on Internet, Law & Politics.

[27] 2023. Müller, F. I., & Richmond, M. A.: The technopolitics of security: Agency, temporality, sovereignty. Security Dialogue, 54(1), 3–20. https://doi.org/10.1177/09670106221141373. See also: 2016.Cullather, Nick: Explaining the History of American Foreign Relations. P. 102 - 118. In: F. Costigliola, F., Hogan, M. (Eds.): Explaining the History of American Foreign Relations. Cambridge: Cambridge University Press.

DOI: https://doi.org/10.1017/CBO9781107286207.007.

This is important because the diffusion of new technologies has the potential to disrupt political systems and institutions, and the regulatory implications of new technologies are becoming increasingly important. The relationship between technology and society is situational and embedded in human action, and the innovation process is influenced by political and cultural practices. In addition, investment in technological development is becoming increasingly important in power struggles, and attention structures are crucial in this regard.[28] The concept of digital sovereignty raises important questions about the role of technology in shaping political power, and how national and international actors can work to ensure that technological developments are consistent with democratic and ethical principles. It highlights the need for a new form of governance that can navigate the complex and interconnected landscape of technology and politics, and balance competing interests in pursuit of common goals. As such, it is a key area of concern for those interested in the intersection of technology and politics, and the broader field of technopolitics. However, different political systems have developed very different ways of dealing with technopolitics, which are reflected in their characteristics of (technological and even digital) sovereignty. We also look at the political concept of digital sovereignty that has emerged in recent years as nations seek to respond to the possible dangers of the uncontrolled spread of foreign intelligent technology, as different nations seek to enhance digital sovereignty, or to make their point by using this concept against or for technopolitics. To show these interlocking tendencies in a complex political-technological world means taking up different strands of development and showing their interconnections.

[28] Prime Minister of United Kingdom: Global Britain in a competitive age. The Integrated Review of Security, Defence, Development and Foreign Policy. 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/975077/Global_Britain_in_a_Competitive_Age-_the_Integrated_Review_of_Security__Defence__Development_and_Foreign_Policy.pdf. Last access: 27.03.2023.

3. Agency and Technology – Technology Pragmatism

The concept of technopolitics refers to the development of intelligent technologies that are not merely neutral tools but have agency through their design and intended use. The interpretation and use of technologies are socially constructed, shaped by historical, political and institutional conditions. As such, the choices made at the outset of technological innovation, as well as the subsequent diffusion of devices have implications for future choices, perceptions, and changes. While technology is often portrayed as a driver of change, this narrative oversimplifies the complex relationship between technological development and social structures. Rather than a causal relationship, technological development and democratic institutions are mutually constituted and contingent.

"Technologies are human creations and are thus subject to human choices, even if they may create circumstances that are not unproblematically under human control (such as climate change)."[29]

If we use a concept within the framework of actor-network theory according to Michel Callon and others, then an object becomes a non-human actor when it encounters a human actor and the relationship between the non-human actor and human actor becomes something new[30]. Imagine a murderer shooting at a human - without the gun, the act loses its meaning, but without the human who uses the gun, the gun cannot be understood - only the connection of both elements has brought about a specific meaning.

In the sociology of technology, a gun is understood to be a trivial machine, with an instrumental use. The emergence of technological agency in human-computer relations goes beyond example of a simple device such as a gun or a coffee machine and this very simple human-technology interaction. Two examples may illustrate this: In the field of robotics, the development of artificial intelligence and machine learning has led to machines that can make autonomous decisions and take actions based on those

[29] 2020. Torpey, J.: A sociological agenda for the tech age. Theory and Society, Nr. 49. P. 749–769. https://doi.org/10.1007/s11186-020-09406-0

[30] .Jóhannesson, G.T, Bærenholdt J.O.: Actor-Network Theory/Network Geographies. In Kitchin, Rob, Thrift, Nigel (Ed.): International Encyclopedia of Human Geography. Elesevier 2009. Pp. 15-19.

decisions. These machines are not simply tools! Robots are no passive tools to be operated by humans, but rather active agents that can decide on their own actions and interactions with the environment but normally reduced to a specific use. Imagine a self-driving car that suddenly encounters a stone on the road. Instead of waiting for human intervention, the car's sensors and algorithms allow it to analyse the situation and decide on the best course of action, such as braking to avoid the obstacle. In this example, the car's technological agency allows it to act autonomously and make decisions based on its own analysis of the situation, rather than simply following pre-programmed instructions. The second example is surgical robots used in medicine. In this case, the surgical robot could be seen as a non-human agent in a relationship with the surgeon. The robot has the ability to amplify or modify the movements and actions of the surgeon, thus influencing the way an operation is performed. At the same time, the surgeon influences the robot through his decisions and instructions. The relationship between the robot and the surgeon thus creates a form of situational technology agency that did not exist before.

The pragmatic approach to technology has generalised this: The sociology of technology understands a gun as a trivial machine. Roger Häußling refers to Rammert, who divides technology according to the degree of agency a technology can have, which is linked to the agency of actors.[31] The more agency a technology has, the less a human actor has in interacting with the technology. The lowest level of technology is passive and is a tool (like a gun). Above that are the active machines (like engines or chainsaws). Above that are reactive machines that connect machines to sensors (like a modern coffee filter machine). The next highest form of technology is the so-called interactive machine. Apart from transactive technology, interactive machines have the highest degree of

[31] 2010. Häußling, Roger: Techniksoziologie. In: Kneer,Georg, Schroer, Markus (Eds.): Handbuch Spezielle Soziologien. VS Verlag für Sozialwissenschaften Wiesbaden. P. 623-643. https://doi.org/10.1007/978-3-531-92027-6. https://link.springer.com/content/pdf/10.1007/978-3-531-92027-6_36.pdf?pdf=inline%20link. Citing: 2003. Rammert, Werner: Technik in Aktion: Verteiltes Handeln in soziotechnischen Konstellationen, in: Thomas Christaller/Josef Wehner (Hrsg.), Autonome Maschinen, Wiesbaden, P. 289-315.

agency within interaction - the hybridisation of processes leads to a reduction in human intervention and control, as Weyer notes.[32]

The pragmatical aspect of technology is emphasized besides its interpretation as material artefact or cultural scheme: the rising 'agency' of artefacts and the 'distributedness' of activities in hybrid constellations are the two main characteristics of advanced technologies."[33]

This can be explained: Provided that interactive technology participates in decision-making processes, it transforms the instrumental relationship between humans and technology into an interactive one. Technology becomes a partner and co-decision-maker in cooperative processes that take place in distributed, hybrid systems. We often think of technology as a single, manageable machine, like a laptop, or a very large facility, like a waterplant. But we are also talking about technology infrastructure, which is complex and its parts are far apart as it is the case with an interactive, hybrid technology or nested heterogenous systems. The pragmatic point of view works above all with the prospect of interaction, where actions are not singled out. This is the case with interactive, hybrid technology and also with nested, heterogeneous systems.

Werner Rammert names an example of this to understand the changes from interactive and hybrid technology to transactive systems like nested, heterogenous systems in technology from perspective of avionic. Air traffic, is a complex, integrated system involving actors such as pilots (using an aircraft), air traffic controllers (using primary radar to identify flight movements and secondary radar to identify the aircraft in an automated identity query in an agent-to-agent interaction), and ground crews with technology agents in their specific domain. These actors and agents (and actors to actors

[32] 2006. Weyer, Johannes: Die Kooperation menschlicher Akteure und nicht-menschlicher Agenten - Ansatzpunkte einer Soziologie hybrider Systeme. Working paper Nr. 16. Dortmund: Technische Universität Dortmund, Wirtschafts- und Sozialwissenschaftliche Fakultät, Fachgebiet Soziologie Lehrstuhl Wirtschafts- und Industriesoziologie; Technische Universität Dortmund, Wirtschafts- und Sozialwissenschaftliche Fakultät, Fachgebiet Techniksoziologie. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-120992. ISSN 1612-5355. https://www.ssoar.info/ssoar/bitstream/handle/document/12099/ssoar-2006-weyer-die_kooperation_menschlicher_akteure_und.pdf

[33] Werner Rammert: Technik als verteilte Aktion Wie technisches Wirken als Agentur in hybriden Aktionszusammenhängen gedeutet werden kann. Technical University Technology Studies Working Papers TUTS-WP-3-2002. P.3.

or agents to agents) must work together to ensure air travel. Air transport is "a system of homogeneously integrated systems in which tasks and subsystems are functionally divided". We see a "tight interlocking of the interacting elements". [34]

"Due to the small number of possible states, conventional technology is completely predictable for the human user; it shows trivial, pre-programmed patterns of behaviour, does not change through learning processes and does not develop emergent structures. Because of this, the human actor can include it in his strategic calculations."[35]

Rammert names here, in the transformation from an interactive to a transactive system the case of autonomously acting technical agents, like autonomous battle planes. They have the ability to detect targets on their own and decide on their own, what actions they take. They communicate with the radar system on the ground autonomously for instance, or check the environment autonomously. They are a mobile, pro-active, context-sensitive, cooperative machines. This is where the power of a multi-agent system (MAS) lies, as it allows multiple autonomous actors/agents to work together to solve problems, meaning that not all actors/agents in the system need to have the same skills and knowledge to successfully complete a task by using a combination of solutions from different actors/agents. This allows for the creation of agent experts within the system.

"It is only when the elements can behave towards each other, behave differently and even change their behaviour in the light of previous experience and situational circumstances that it makes sense to speak of interaction and cooperation." [36]

Within the transactive system, the machines "cooperate with one another, thereby moving, taking the initiative and addressing others. They coordinate the cooperation themselves and communicate the result of their activities to the human user.".[37] Another

[34] Ibid. P.5.

[35] 2006. Weyer, Johannes: Die Kooperation menschlicher Akteure und nicht-menschlicher Agenten: Ansatzpunkte einer Soziologie hybrider Systeme. (Soziologische Arbeitspapiere, 16). Dortmund: Technische Universität Dortmund, Wirtschafts- und Sozialwissenschaftliche Fakultät, Fachgebiet Soziologie Lehrstuhl Wirtschafts- und Industriesoziologie; Technische Universität Dortmund, Wirtschafts- und Sozialwissenschaftliche Fakultät, Fachgebiet Techniksoziologie. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-120992 P. 17.

[36] Ibid. P.7.

[37] 2008. Rammert, Werner: Where the Action is. Distributed Agency between Humans, Machines, and Programs. In: Uwe Seifert, Jin Hyun Kim, Anthony Moore (Hg.): Paradoxes of Interactivity. Perspectives for

example would be ChatGPT, as it has the ability to decide about its answers and can answer, a second time asked, in another manner, which means, this technology has reached a level of contingency that has rarely been seen before. Nested Heterogeneous Systems are mainly interactions of highly complex, autonomous, specialised machines.

The most discussed are multimodal deep learning machines like ChatGPT4 (Generative Pretrained Transformer 4). It can process language and image input and output and according to a Microsoft research team, it has the ability to decide and use tools that have not been pretrained[38], and can interact with drones and control robots.[39]

"It [ChatGPT] is able to reason about which tools it needs, effectively parse the output of these tools and respond appropriately (i.e., interact with them appropriately), all without any specialized training or fine-tuning."[40]

A good example of how the agency of a machine not only develops by its structure, but its target is ChaosGPT[41] as it was given access to the Internet, developed Twitter and Telegram accounts, developed its own website[42], researched Google contacted other language models to outsource tasks and was given the goal to destroy humanity.

Media Theory, Human-Computer Interaction, and Artistic Investigations. Bielefeld: transcript. P. 67. DOI: https://doi.org/10.25969/mediarep/2718

[38] Bubeck, Sébastien, Chandrasekaran, Varun, Eldan, Ronen, Gehrke, Johannes et.al. (Microsoft): Sparks of Artificial General Intelligence - Early experiments with GPT-4. 2303.12712.pdf (arxiv.org) Last access: 31.03.2023.

[39] Autonomous Systems and Robotic Group Mircrosoft: ChatGPT for Robotics – Design Principles and Model Abilities. 20.February.2023. https://www.microsoft.com/en-us/research/group/autonomous-systems-group-robotics/articles/chatgpt-for-robotics. Last access: 31.03.2023.

[40] Ibid. Bubeck, Chandrasekaran, Eldan, Gehrke et.al. P.49.

[41] https://youtu.be/g7YJIpkk7KM, https://youtu.be/kqfsuHsyJb8, ChaosGPT ist der erste konkrete Versuch, mit KI die Menschheit zu vernichten (the-decoder.de)

[42] Chaos Gpt (chaos-eth.org)

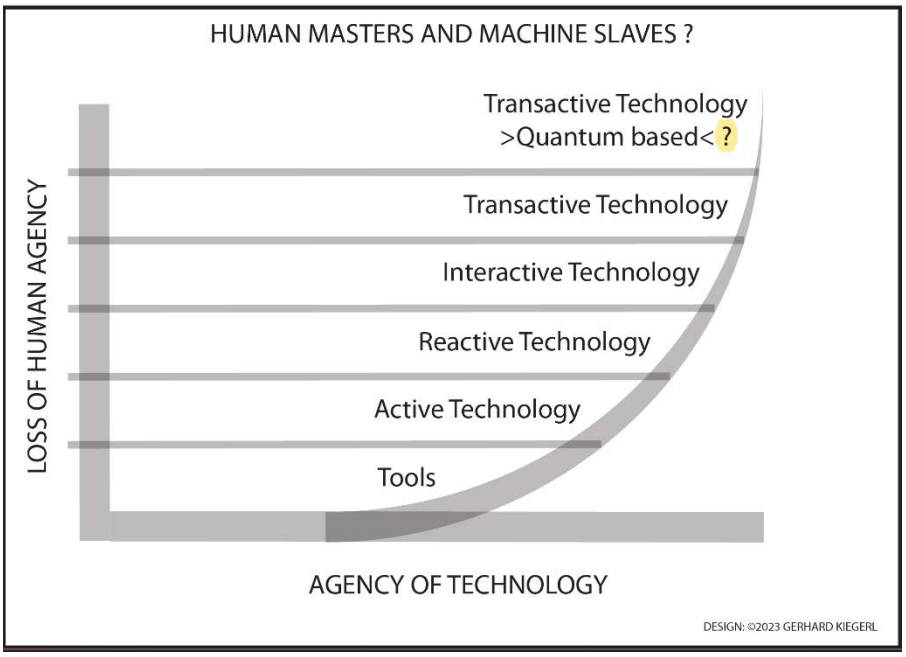

Figure 2: Human Masters and Machine Slaves? Astrid Bötticher. Design: Gerhard Kiegerl.

Technology has agency because of its design, its assigned purposes.[43] Technologies are interpreted by people, they are assigned a use, and their characteristics are compared with the previous world and assigned a "place". Technological leaps do not simply collide with historically developed societies and their institutions, but are tangentially influenced as leaps by social[44] and institutional[45] conditions. Technology development is

[43] Rammert, W., (2002a): The Cultural Shaping of Technologies and the Politics of Technodiversity. In: Sørensen, K.H., Williams, R. (Ed): Shaping Technology, Guiding Policy – Concepts, Spaces & Tools. Cheltenham: Edward Elgar Publishing, P. 173-194. See also: Rammert, W. (2002b): " The Technical Construction as Part of the Social Construction of Reality". Paper presented at the conference "New Perspectives in the Sociology of Knowledge - On the Actuality of a Research Paradigm. Thomas Luckmann on his 75th Birthday" in Konstanz on June 21, 2002. Technical University Berlin, Technology Studies Working Papers TUTS-WP-2-2002. See also: Rammert, W. (2006): Technik, Handeln und Sozialstruktur: Eine Einführung in die Soziologie der Technik.Eine Einführung in die Soziologie der Technik Technical University Technology Studies Working Papers TUTS-WP-3-2006. P. 8-9. Microsoft Word - Dokument1 (tu-berlin.https://www.ts.tu-berlin.de/fileadmin/fg226/TUTS/TUTS_WP_3_2006.pdfde). See also: Rammert, W. (2016): Technik – Handeln – Wissen Zu einer pragmatistischen Technik- und Sozialtheorie. 2nd edition. Berlin, Heidelberg. Springer.

Rammert, W. (2021): Technology and Innovation. In: Hollstein, B., Greshoff, R., Schimank, U., Weiß A. (Ed.): Soziologie - Sociology in the German-Speaking World. Special Issue Soziologische Revue 2020. https://doi.org/10.1515/9783110627275-034. See also: Rammert, W. (2023): Wie die Soziologie zur 'künstlichen Intelligenz' kam - eine kurze Geschichte ihrer Beziehung. In: Muhle, F.: Soziale Robotik: Eine sozialwissenschaftliche Einführung, De Gruyter Oldenbourg (2023).

[44] An example of this fundamental relationship is the "fundamental right to guarantee the confidentiality and integrity of information technology systems". See: 2020. Pernice, Ingolf: Staat und Verfassung in der Digitalen Konstellation. Tübingen. Mohr Siebeck. P. 67.

[45] 1992. Hennen, L., Institut für Technikfolgenabschätzung und Systemanalyse: Technisierung des Alltags. Ein handlungstheoretischer Beitrag zur Theorie technischer Vergesellschaftung. Westdeutscher Verlag.

a process within the social order and is therefore 'inherently' social rather than technical.[46] Yet the development of transactive systems shows us, that machines can develop on their own – and decide to use tools that they do not know as they were not part of pretraining.

Douglass C. North makes a very relevant point about technology when he talks about slaves and masters and how rights and rules reduce transaction costs.[47] This can easily be applied to the relationship between man and machine. Tools require constant human operation: a hammer sits around unused. A tool is a fully controlled slave of man. Over time we have given our machines more and more autonomy in order to reduce our transaction costs. Engines run themselves when they have enough fuel. This makes work easier for people and reduces transaction costs. With interactive machines like smartphones, transaction costs are reduced even more - because of algorithms, I can look up maps, chat and make phone calls, or just browse websites, etc. So the smartphone has reduced the transaction costs of everyday actions in many areas. I don't have to read a travel book before going somewhere. All I have to do is open my smartphone and with the right app I can easily find my way around a foreign country and enjoy my trip without much planning. We have already talked about the power of algorithms. We cannot set the algorithms ourselves, but free market players do it for us. The developers of the algorithms understand what the machine is doing and can intervene - be they motivated through soft or hard law. This is different when we talk about transactive machines, because if the machines largely decide for themselves and we can no longer understand why they have decided this way or that or what kind of tools they take from where and for what purpose, i.e. their decisions are contingent, then we can largely no longer talk about a master (human) and slave (machine) relationship, but the relationship is either master to master or slave (human) to master (machine). But how do we tell a machine to

[46]"Technologies are produced and used in particular social contexts, and the processes of technological change are intrinsically social rather than simply being driven by a technical logic." 2002. Russel, Stewart, Williams, Robert: Social Shaping of Technology - Frameworks, Findings and Implications for Policy. In: Sørensen, Knut, Williams, Robin: Shaping Technology, Guiding Policy - Concepts, Spaces&Tools. Cheltenham, Northampton. Edward Elgar. Q.A. Op.Cit. 2010. Hahn, K. P.35-50.

[47] Douglass C. North: Institutions, Institutional Change and Economic Performance. Cambridge University Press., Cambridge 1990. P.32-35.

do this or that when even the designer is not sure why a machine is doing this or that? This is where the idea of regulation by design comes in. Since the design of the machine regulates the principles of the machine and could potentially limit its evolutionary path, it is becoming increasingly clear that the design of technology has become part of the humanities, as it is inherently a legal debate about how to establish effective and meaningful rules that function in accordance with human rights or other fundamental rights that a human being has. This needs to be applied to the design of machines at an early stage, as we are facing a possible endangerment of humans in a master to master relationship between humans and machines, or even a slave to master relationship (where the master is the machine, mind you). This means our transaction costs must always be unknown. The human ability to control decisions now depends on how the device is designed. This of course has massive consequences for politics and society. The speed of a device also plays a role here: An artificial intelligence in the sense of a transactive technology that can be placed on a (functioning!) quantum computer, for example, could have completely different consequences than a realised artificial intelligence based on digital processes would have anyway. The example of the legal system is a good illustration of this. The example of the legal system is a good illustration of this. An example of current problematic regulation is the EU Commission's TRL list, as it does not include the humanities in the early stages of technology development. But as we now know, we can build machines that can endanger our society - and so technology design becomes an integral part of regulation.[48]

Dealing with these big leaps in development, the early decisions made at the beginning of an innovative process, the later decisions on how to disseminate what kind of devices under which conditions (and dealing with the megatrends that shape the future), also have implications for later decisions, perceptions and change.[49]

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[48] European Commission: HORIZON 2020 – WORK PROGRAMME 2014-2015 General Annexes. Extract from Part 19 - Commission Decision C(2014)4995. G. Technology readiness levels (TRL) h2020-wp1415-annex-g-trl_en.pdf (europa.eu) . See also: TRL | EURAXESS (europa.eu)

[49] Guruparan,Kumaravadivel, Zerk, Jennifer : Influence of soft law grows in international governance. Comment. Chatham House 2021. https://www.chathamhouse.org/2021/06/influence-soft-law-grows-international-governance . See also: 2010. Hahn, K.: Innovationsprojekte zwischen forschungsintensiven und forschungsschwachen Unternehmen - Abstimmungsprobleme und Lösungsansätze. In: Biniok, P. (Ed.): Technik,

The agency of technology arises from its connection to human actors or from its independency from humans. Technology regulates human actions, and its diffusion can serve or undermine political purposes as a form of soft power. And while Jeanette Hofman is utterly right about the problem to give an object like technology its own actor status, it might become visible here, that agency is created by connection/Indepence processes and this impacts decisions. We can understand agency as a form of a soft power in itself, yet the dissemination of technology for political purposes can also turn soft power into political strategy to gain momentum in foreign countries. This is pictured now in the international political arena.[50]

Digital technology is often assigned the role of "driving force", while the democratic system of government is rather a "reactive institutional structure" - either acutely endangered or a beneficiary. This is the presentation of two independent variables as a "causal relationship". It argues that the representation of technology as an actor is illegitimate and that technological development is contingent and open to development. By doing so, reciprocal constitution processes are underestimated or ignored.[51] Mareile Kaufmann argues[52] technology has become “a matter that matters”, a precondition to decision.

3.1. Temporality of Technology

We can distinguish two phases in time that deserve a closer look. The first is the development of technology, which is always under development in a world where technology is ubiquitous. This phase is crucial for influencing the design of technology and its standardisation (which is highly explosive, although some in STS tend to see this as a "boring object of study"), since the design of an object is ultimately also related to

Wissenschaft und Politik. Frankfurt Main, Berlin, Bern, Brussels, New York, Oxford, Vienna. Peter Lang. P. 40-43.

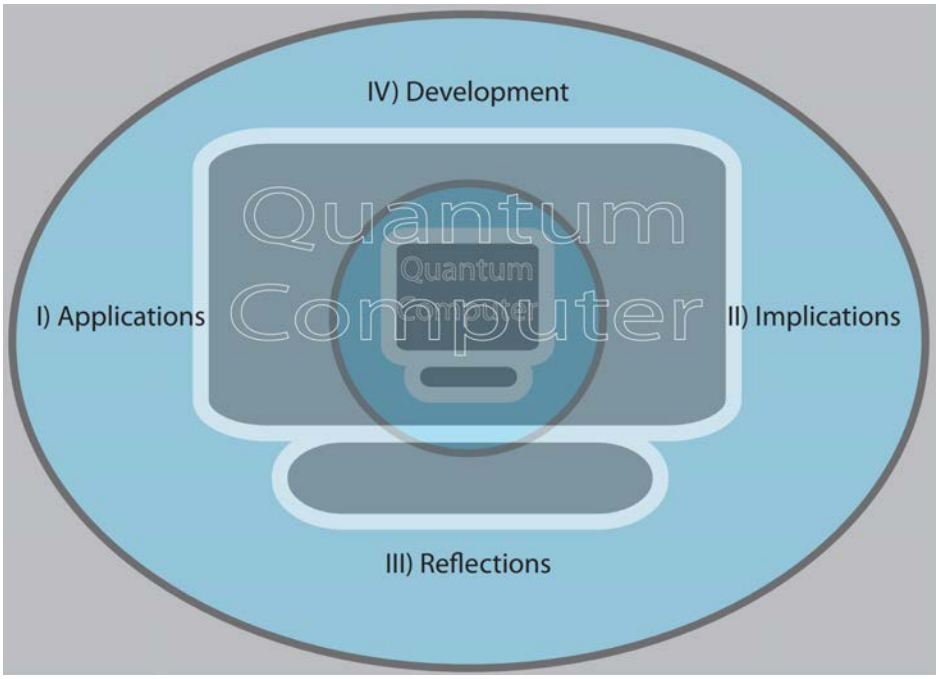
[50] Influence of soft law grows in international governance | Chatham House – International Affairs Think Tank

[51] 2019. Hofmann, Jeanette: Mediatized Democracy in Times of Digitalization - A Researcher's Perspective. In: Hofmann, Jeanette , Kersting, Norbert, Ritzi, Claudia, Schünemann, Wolf (Ed.): Politik in der digitalen Gesellschaft Zentrale Problemfelder und Forschungsperspektiven. Bielefeld. Transcript. P. 28.

[52] Kaufmann, Mareile: Who connects the dots? Agents and agency in predictive policing. In: Hoijtink, Marijn, Leese, Matthias: Technology and Agency in International Relations. London: Routledge 2019. P. 141-163.

its regulation. An old example, but still applicable here, is Facebook. First there were the platforms. They were designed to meet the needs of businesses to develop a data economy. But problematic issues such as hate speech or even human trafficking via platforms were not envisaged, and therefore the design of the platforms did not initially include built-in measures to combat them. Today, informed science is working with ideas of ethics by design to develop new selection algorithms and new moderation practices.[53] Next to the development of a technology is its phase of diffusion and the way societies adapt to new technologies, how they set new rules, develop new institutions, adopt new forms of communication or how a culture adapts. Many technologies, and technology in general, have led to adaptation. On the one hand, new benefits have emerged, but also new vulnerabilities. Of course, the two can overlap - an extended technology is built upon more incrementally. For disruptive technologies, however, this temporal separation can ideally be maintained.

As part of the examination of the development of quantum technology, an approach has emerged that differentiates the development and dissemination of quantum technology in terms of time and includes various aspects of observation, which can, however, also be generalised.



[53] Platform://Democracy – HIIG

Figure 3: Core Elements of Quantum Technology. Bötticher, Seskir 2023. Design: Gerhard Kiegerl.

The field of quantum humanities is a hybrid research area that lies at the intersection of humanities, social sciences, and quantum computing, but it has something to tell, regarding time and process of Technology development and dissemination. Quantum humanities encompasses four central elements, including 1. the application of quantum computing in different research fields, touching the humanities and social sciences, 2. Reflection how technique and technology changes fundamental assumptions and what the implications of the technique/technology will be, and also the strength of the device in impacting previous systems 3. the identification of societal, cultural, and social implications, and 4. the examination of how development processes and ecology are structured and driven forward.[54]

In this sequence, even though it is not presented here as a process, there is a technological process: first the development that is developed in a society by the members of that society, then the fundamental questions that are raised by new knowledge and new developments, and which may affect not only a single science but many fields of science, as here quantum theory is affecting the humanities and social sciences. And finally, the question of how societies change with a technology, building new institutions and making the new something regulated, something habitual.

The agency of a technology is developed by engineers, by physicists, by computer scientists and so on. With the help of the TRL list, we know more or less what stage a technology is at. But this is a very simple statement. Engineers do not "give" a technology an agency. It is through social and engineering processes that a technology is designed, thought about, redesigned and so on. However, the TRL list underestimates the impact that ethics and legal systems have on the design of a technology. The agency of a technology is developed by engineers, by physicists, by computer scientists and so on. With the help of the TRL list, we know more or less what stage a technology is at. But

[54]2022. Astrid Bötticher, Zeki C. Seskir, Johannes Ruhland: Introducing a Research Program for Quantum Humanities: Theoretical Implications. 25 Dec 2022.
[2212.12947] Introducing a Research Program for Quantum Humanities: Theoretical Implications (arxiv.org)

this is a very simple statement. Engineers do not "give" a technology an agency. It is through social and engineering processes that a technology is designed, thought about, redesigned and so on. However, the TRL list underestimates the impact that ethics and legal systems have on the design of a technology. Even our knowledge has an impact on the agency of a technology and its design. Think of FCKWs and how the lack of knowledge about how strongly FCKWs affect the ozone layer affected the design of the fluid itself and its integration into applications. The same is true of quantum technology: in the first wave, scientists started to understand how to use quantum, but they could not get stuck in. So in the first wave we saw lasers, transistors, computer chips and so on. Today, with the knowledge of how to develop quantum dots, how to manipulate single very small pieces of a split of an atom, a quantum computer is within reach. Here, too, we find social negotiation processes. If it matters how science is organised, how infrastructure is provided, and who uses it and how, then the application of what we use a piece of knowledge for and how also matters a lot, and the proliferation of the unexpected may change what is already rehearsed, what is familiar, the way society is organised, and, more abstractly, these gains may change the way we play the game. These changes affect the devices on the one hand, but also the processes in society on the other.

3.2. Technological Agency within society

Machines, tools - everything develops within a framework shaped by human interactions with each other and with things - around intelligent technologies develop technological shells. But even in earlier political science works, quite different technical installations, such as railway tracks, telephone lines, and air transport infrastructure, were understood as large-scale mechanical installations[55] that created institutional change[56] in the widest sense. According to Steiner and Grzymek, technology has a direct influence

[55] Mayntz, Renate, Thomas P. Hughes (Ed.): The Development of Large Technical Systems. Schriften aus dem Max-Planck-Institut für Gesellschaftsforschung, Band 2. Frankfurt a.M.: Campus Verlag, 1988.

[56] North, Douglass C.: Institutions. *Journal of Economic Perspectives* – Vol. 5, Nr.1, Winter 1991. P. 97-112.

on the world we live in; values flow into technology and technologies are accordingly "the real implementation of values". [57]

The German Academy of Science and Engineering's model of the "institutional shell" is well able to explains how the agency of a device forms society and its institutions. On the one hand, it shows the complex relationships between technology and social and institutional processes, but it also shows that social and institutional processes have a feedback effect on the development of technology, so that technology has its own agenda without being an actor itself, but this agenda is definitely fed by institutional and social conditions, so that technology is always also the product of people who live in a society and its rules (be they standards, regulations or customs) and develop it.

The agency of technology has the ability to change institutions. In 'The Ethics of Invention - Technology and the Human Future', political scientist Sheilla Jasanoff argues that technologies already regulate our societies as much as laws. We live in a world of technological development. Technology shapes our daily behaviour, but also causes us to reorganise ourselves completely. In this context, technology itself is something political and is not initially used for political purposes – it is, in Douglass C. North words an informal constraint that leads to following informal and formal constraints.[58]

This important point we should not fail to grasp is the meaning of technology as a political end. The interaction between technology and people, but also the activity or existence of technology within a society with a certain use, must be seen as a political expression.[59] Even for the institution of law, it is difficult to find 'neutral' science that could help the courts make decisions about technological development and its ethical implications. Instead, political persuasion fills these gaps.[60]

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[57] Op.Cit. 2020. Steiner, F, Grzymek, V.

[58] Douglass C. North: Institutions, Institutional Change and Economic Performance. Cambridge University Press 1990.

[59] 2016. Jasanoff, S.: The Ethics of Invention: Technology and the Human Future. W.W. Norton, New York 2016.

[60] 1995. Jasanoff, S.: Science at the Bar - Law, Science, and Technology in America. Harvard University Press 1995. Pp. 207-2010.

In addition, a look at the institutional framework of technology reveals the forms of soft power that intelligent machines or large facilities such as airports, metro networks or ports can take. The development of technology and 'governance by design' thus also come into view, reflecting the complex relationships between technology and society.

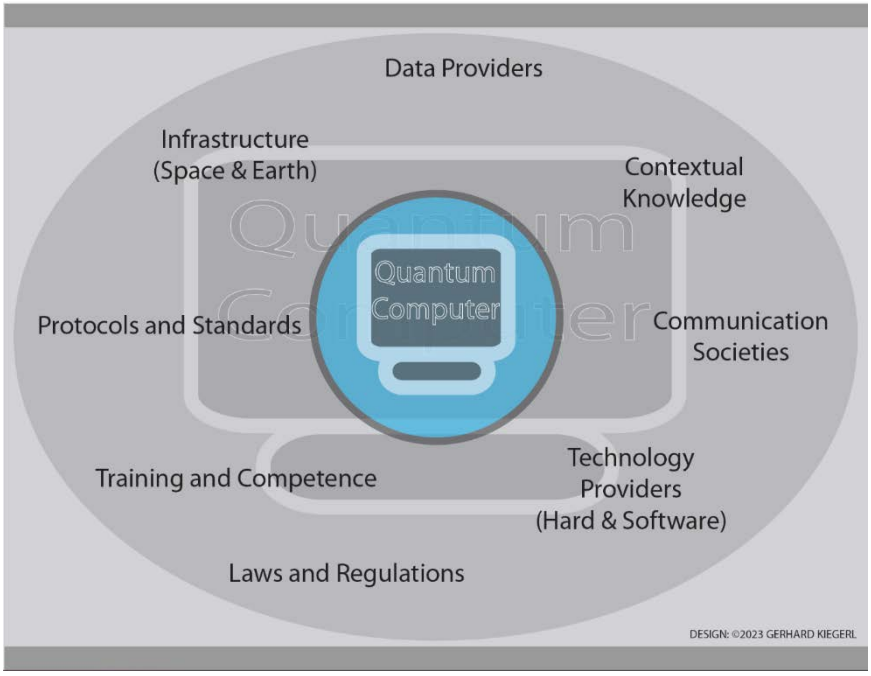

Figure 4: (Illustration Original: Organizational shell using the example of PC. In: Intelligente Objekte. Acatech diskutiert. German Academy of Science and Engineering.) Astrid Bötticher. Design: Gerhard Kiegerl.

The relationship outlined here echoes a discussion linked to STS.

Sheila Jasanoff aptly notes that a networked society, with its institutions, favours a form of distributed agency and action in which dispersed causality is a reality and responsibility is diffused in this way. Society cannot respond holistically to a new technology, but intervenes in its own specificity with its own specialities, such as law, technical infrastructure, new forms of social conversation, an education system, etc. Jasanoff makes it clear that the events that can be mapped with the Acatech model can also have a political purpose. In the context of Actor Network Theory (ANT), she refers to Bruno Latour when she points out that the order of things is not natural, that actors-agents-individuals (i.e. networks that can point far beyond their specialised subject) can be completely different nodes in a network and that their edges, their relations, can

therefore vary in form and depth. For this reason, technical developments cannot be described in terms of simple dualisms such as right - wrong or political - apolitical. But it can also not be enough to simply describe networks.

“If networks diffuse responsibility, they can also depoliticize power by making its actions opaque or invisible. Here again, a cardinal virtue of network analysis, namely, its utility in explaining how big formations cohere, calls for a confrontation with critical political theory.”[61]

To address this problem, she introduces the notion of socio-technical imaginaries into the network constellation. However, it is questionable whether a topography of power has to refer primarily to a vision (and in the case of developments such as Facebook and ChatGPT one can ask whether they really exhibit a social vision), or whether visions are not also part of a contingent reality to be described, in which technical agents, human actors, institutions and their path dependencies and structures of social games in the broadest sense exhibit an interconnectedness in which the topography of political power unfolds and visions compete. Every technology, every knowledge finds its imaginations for its use.

Jasanoff defines "sociotechnical imaginaries [...] as collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understanding of forms of social life and social order attainable through, and supported by advances in science and technology".[62]

With this term, she wants to fill an in-between space that stands out from the reality of network descriptions. She writes that there is a theoretically underdeveloped space here because normativity is not present in the understanding of network realities that is common in STS. She writes: "Our definition brings together the normativity of the imagination with the materiality of networks: socio-technical imaginaries are thus

[61] Jasanoff, Sheila: Future imperfect – Science, Technology, and the Imaginations of Modernity. In: Ibid., Kim, Sang-Hyun: Dreamscapes of modernity – sociotechnical imaginaries and the fabrication of power. Chicago University Press 2013. P. 16.

[62] Ibid. P. 4.

'collectively held and enacted visions of desirable futures' (or of resistance to undesirable ones), and they are also 'animated by shared understandings of forms of social life and social order that are achievable through and supported by advances in science and technology'.[63] Thus she indirectly accuses the STS approach of being apolitical, because it is not the normativity of democratic self-organisation that is in the foreground, but the processes of self-organisation. The question is whether a process-oriented science leaves out imaginations and hopes for a better world through technology. But the question is also whether there is any idea at all that a society shares about a technology, a device, a machine, in the sense of an underlying ideology (although she argues against ideology as a term, seeing it as an inflexible belief system). Do societies share a single idea of desirable futures, or can these futures be multiple? Is it really always the case, for example, that circles working on technology regulation, standardisation, infrastructure development or the introduction of new institutions or the systemic adaptation of institutions share a common idea of a desirable future through technology?

She argues that this is not necessary, pointing out that 'multiple imaginaries can coexist in a society in tension or in a productive dialectical relationship', and delegates the victory of visions to processes within political institutions (political power games, as North would probably put it) that decide which vision will be dominant. She ascribes this to institutions such as the legislature, the judiciary or the media, or "other institutions of power, which elevate some imagined futures above others, giving them a dominant position for policy purposes".[64] It is about networks that span institutions, organisations, etc. It is about people who are integrated into social structures. So in the end, their vision of sociotechnical imaginaries is not far removed from the concept of ANT. At the same time, however, a problem remains unsolved with socio-technical imaginaries: To what extent does a new knowledge, from which technology emerges and which is embedded in technology, allow for visions at all? After all, no one would

[63] Ibid. P.19.
[64] Ibid. P.4.

think that an egg cup could be used for duck hunting. At the same time, it cannot be ruled out that someone misuses technology - because an egg cup can of course also be used as a drinking vessel, and a misuse of technology or an unintended use of technology can certainly not be ruled out. However, no one would think of regulating egg cups as a means of duck hunting or of designing an egg cup in a standardisation process in such a way that a duck can also be shot with it. Technology thus has a form of agency that can be linked to visions of its utility, which in turn are assessed as policy-relevant by different networks of different organisational units in society. This means that visions are not unimportant, but they are only a small part of how society reacts to technology and technology reacts to society.

What happens when technology is overlaid with power politics and is not intended to be used to solve concrete problems of a society? What if technology is not an enabler of a (political) desire for a societal future, but a new game of power politics, to be used as a tool to change the power games in other territories by simply using it?

Jasanoff`s image of democratic political performance refers to a story of Ezrah in which technology plays a central role in the development of nationalism by ritualistically presenting technology as a communal achievement to prove itself to citizens.[65] But frankly, we do not need democracy to harness technology for some form of nationalism. Technology today is probably more of a general artefact of power that is used between the governed and the governed. But that still doesn't clarify the inter-state relationship in which technology is also a reality - and I don't mean specifically the form of war technology that has always been used as a means of power, such as mustard gas in World War I or powerful weapons of war like the atomic bomb. I am referring to mobile phones, algorithms, new forms of disruptive technology like quantum technology, social platforms, or satellite-based internet.

[65] Ibid. 12.

With this consideration, Jasanoff strikes a note that has also been taken up by narrative economics around Robert Shiller[66] and by relational sociology around Harrison White[67]. In this way, Jasanoff's approach does not stand out from the STS (Science, Technology, Society) model of a technological shell originally developed by Acatech but can be linked to it. While individual institutions of society are concerned with solving the subtasks posed by new technologies and new devices, and respond to the agency of a technology, investment in technology, its development, dissemination and regulation are accompanied by communication, and different goals can come together.

Vulnerability and Devices

In the technological bracket created by the emergence of new technologies that are integrated into society and its institutions, it is important to note that this induces various changes that can vary depending on the device. The greater the agency of a technology, the more difficult it becomes to look at a single machine. We cannot divide infrastructures such as the mobile phone network or the railway network with its digital infrastructure into individual machines.

"In a world full of intelligent objects, the possibilities for strategic action are significantly reduced; the delegation of control and steering functions to autonomous machines limits the scope for human action and decision-making and tends to force them into adaptive behaviour. Strategic behaviour always presupposes the (partial) predictability of the interaction partner, which becomes almost impossible with "intelligent" technology due to the multitude of emergent system states."[68]

This is also an important gateway for influence by technology providers themselves or by the legislature in which a technology provider finds itself. Indeed, legislators also

[66] 2017. Shiller, Robert: "Narrative Economics". In: American Economics Review 107 (4). P. 967 – 1004.

[67] 2008. White, Harrison: Identity and Control - How Social Formations Emerge. 2nd Ed. Princeton University Press. Princeton.

[68] Op.Cit. 2006. Weyer, Johannes: P.24.

need legal data from other nations to a much greater extent in order to make meaningful regulations, especially with regard to human rights and rights that limit the privacy of those subject to the law. This means that the development of hybrid systems is changing the legal organisation of the technological envelope, since national law today can no longer focus solely on national, international, and European law.[69] In addition to the question of the impact of a system component on a hybrid system, there is also the question of how external influences on individual system components can be limited, since the possibilities for human intervention in the ongoing operation of a hybrid system are limited and individual parts of the hybrid system have an impact on the overall system.

One example is the gradual exclusion of Chinese providers from the 5G network being pushed by the German government. In addition to the question of whether Chinese companies should be allowed to participate in the tendering process for the German 5G network, the question also arose over time of whether components from the Chinese manufacturers Huawei and ZTE should be installed in system-relevant areas at all, as they continued to be perceived as a threat of interference (whether through espionage, sabotage or shutdown). A key argument put forward by the German government was that while Chinese manufacturers had stated that they would comply with standards, the Chinese Security Law of 2017 stipulated that state intervention in technology companies was possible at any time, making data analysis by Chinese security authorities just as possible as intervention in technical systems by Chinese authorities against German systems. The test procedure for all system components in (hybrid) system-relevant overall systems or infrastructures planned by the German government for March 2023, is logical because of the potential for foreign state intervention in hybrid systems. Interactive and transactive systems have a heavier impact on the development of technology shell than passive, active or reactive technology has and even though we deal

[69]An example of this fundamental relationship is the "fundamental right to guarantee the confidentiality and integrity of information technology systems". See: 2020. Pernice, Ingolf: Staat und Verfassung in der Digitalen Konstellation. Tübingen. Mohr Siebeck. P. 67.

in this specific case not with security technology per sé, we deal with possible security threats against a political system, its society and institutions.[70]

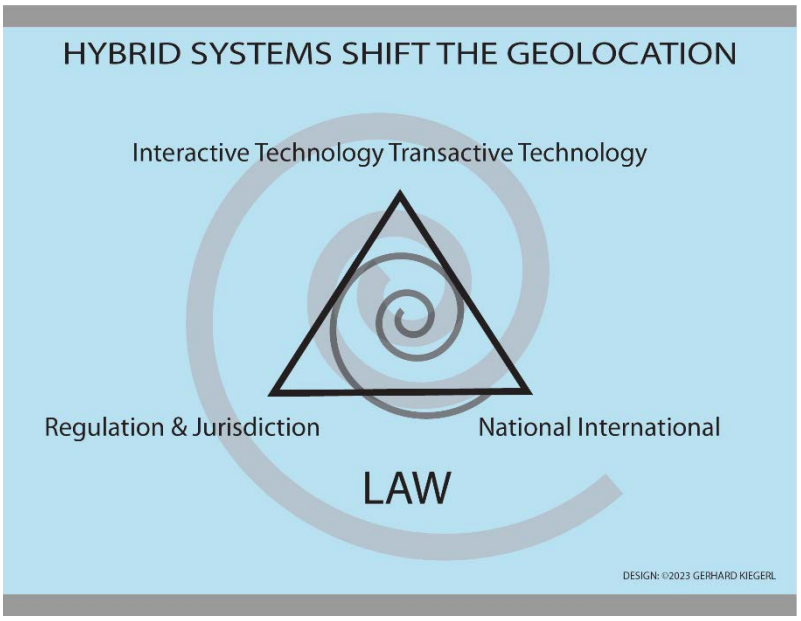

Figure 5: Hybrid Systems shift the Geolocation. Astrid Bötticher. Design: Gerhard Kiegerl.

Compared to the focus on security technology as developed by Edwards and others[71], technopolitics as a concept is comprehensive: it is not only about security technology or classical surveillance, but also about everyday techniques or technology-related decisions, for example, the determination of technology standards. While the example of the large-scale purchase of Chinese security technology by Pakistan or cities and regions in Pakistan[72] is still classically associated with the view that technology

[70] Sokolov, Daniel AJ : Kritische 5G-Infrastruktur: Deutschland plant Einschränkung Huawei und ZTEs. Heise. 07.03.2023
https://www.heise.de/news/Kritische-5G-Infrastruktur-Deutschland-plant-Einschraenkung-Huawei-und-ZTEs-7537157.html

[71] 2016. Guzik, Keith: Making Things Stick - Surveillance Technologies and Mexico's War on Crime. Oakland, University of California Press 2016.

[72] Asia-Times: China's Pakistan investments a double-edged sword - Chinese investment is unmistakably transforming Pakistan but local resistance is rising to all the asset buying and building.https://asiatimes.com/2021/02/chinas-pakistan-investments-a-double-edged-sword/ Last Access 21.03.2023. See also: Hindustan Times: China cements its place as Pakistan's largest supplier of major arms: Report. https://www.hindustantimes.com/world-news/china-cements-its-place-as-pakistan-s-largest-supplier-of-major-arms-report-101650973184494.html last Access 21.03.2023. See also: Pakistan Forward: Is China building a military base in Gwadar? https://pakistan.asia-

policy and therefore technopolitics is a security technology-related concept, this connection is transformed into a general power frame here. Not only classical security technology for surveillance or defence are part of the shell, but also computers, software, chips or technical infrastructure is part of it. Therefore, a concept that understands technology as agent and connects it with institutional shifts, must be technology open in the sense, that it might not take into account tools, but reactive, interactive and transactive technology. The focus here is for instance on classical interfaces or the passing of (online) points, the distribution of daily technology or other examples of technology distribution that are not necessarily classical surveillance technologies.

However, looking at the technology shell, this also means that the concept of technology is somewhat blurred: technology is no longer simply a device such as a smartphone or an IMSI catcher, or a bug that can be attached to a device unnoticed in order to intercept data. It is also any form of reactive, interactive or transactive technology. The proliferation of technology can also refer to infrastructural technology, such as the construction of port facilities (and its digital infrastructure) or a rail network (and its digital infrastructure). With the Chinese strategy of commerce called Silk Road, we see that these kinds of technologies are even purposefully built in foreign regions and trigger power-strategic boundary shifts that relate to a very concrete location, such as the port or the rail network and the nation in which its built in, in effect technology blurrs geospaces.

In this sense, a concept needs to include the (politically forced) use of large (digital) mechanical plants, large infrastructure systems, small-scale programming such as voice or communication bots, intelligent machines in the sense of deep technology such as AI or quantum computing or infrastructure like social networks and transactive technology like a nested heterogenous system.

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news.com/en_GB/articles/cnmi_pf/features/2020/07/24/feature-01 last Access 21.03.2023. See also: International Cyber Policy Centre: Mapping Chinas Tech Giants.
https://chinatechmap.aspi.org.au/#/map/ Last access: 21.03.2023.
Financial Times: Exporting Chinese surveillance: the security risks of 'smart cities'
https://www.ft.com/content/76fdac7c-7076-47a4-bcb0-7e75af0aadab Last access: 21.03.2023.

4. The Concept of Technopolitics

Radical technologies have not only social effects, but also political effects in terms of the distribution of power. To remain capable of analysis, political science today incorporates the political innovations evoked by technology into its conceptual toolkit. Interested in this phenomenon, a new term has emerged in the field of international relations to express a new quality of politics-technology relations in the international arena: Technopolitics. The circular movement of mutual influence (that Renate Mayntz has described in her early works[73]) can also be applied to the effects, technology has on International Relations.[74]

Maximilian Mayer et.al. (2014) identify the possibilities around the term technopolitics in relation to International Relations. For them, International Relations has failed to theorize the technological moment within the international competition, political rivalry, and political network found in International Relations. In their view, technology is not an exogenous phenomenon - but they criticise the fact that it is too often theorised as such in International Relations.[75] The concept is intended to provide a description of this specific phenomenon of technology-based transformation within international relations. Mayer et.al. build their concept around the question of "how are pre-existing entities, processes, practices, and actors affected and transformed by sciences and technologies? And how do they respond and adapt?" [76] Mayer assumes that technology - similar to an actor - influences and changes processes, practices, and actors - they react to this and adapt to new (technological) environments and conditions. The actors working in and with "technology" have entered something into this networked world consisting of processes, and practices and have attracted more actors causing

[73] Mayntz, R.: Netzwerkorganisationen – die Auflösung der geschlossenen Form im Prozess der Globalisierung. In: Lessenich, L. Ed.(2017): Geschlossene Gesellschaften – Verhandlungen des 38. Kongresses der dDeutschen Gesellschaft für Soziologie in Bamberg 2016.

Also: Owen, T.: The networked state and the end of 20th century diplomacy. *Global Affairs*, 2016 Vol. 2, No. 3, P. 301 – 307.

[74] Mayer, M., Carpes, M., Knoblich, R. (Eds). (2014): International Relations and the Global Politics of Science and Technology: Vol. 1 - Approaches, Concepts and Interdisciplinary. Berlin, Heidelberg. Springer.

[75] Op.Cit. Mayer, M., Carpes, M., Knoblich, R.: 2014.

[76] 2014. Op. Cit. Mayer, M., Carpes, M., Knoblich, R. P. 2.

action - this can be observed. But it does not remain that simple. Mayer et.al. want to conceptually bring together 'technology determinism', 'social constructivism', and 'institutional externalism' through their approach. Social constructivism' refers to the 'intersubjective opinion' about technology, the common production of meaning, which, like technological determinism, is linked to institutional constraints/conditions and logics of action, while technology determinism is a critical perspective on design and use of Technology.

While Louise Amoore[77] focuses on political actions related to algorithms, Mayer describes a bouquet of technology-related policies that are all used to pursue their political goals. However, these goals are not only factual, but have a strong power-political connotation. The aim is to gain power and political influence, for example by selling technical products abroad (power through technical facts) or by influencing standardisation processes (power through influence on design). [78] Political power interventions take place in an international system organised through networks.[79] It is assumed that technopolitics can be studied at the interface of international relations and political science. In its further development, Mayer's concept makes it possible to link policy coordination in technology- and science-related policy fields with political power play. [80]

[77] Amoore, L.: Algorithmic War: Everyday Geographies of the War on Terror. Antipode. Vol. 41, Nr.1. 30 January 2009.

[78] 2014. Mayer, M., Carpes, M., Knoblich, R. (Eds.): International Relations and the Global Politics of Science and Technology: Vol. 1 - Approaches, Concepts and Interdisciplinary. Berlin, Heidelberg. Springer.P.18.

[79] 1993. Mayntz, R.: Modernization and the logic of interorganisational Networks. Knowledge and Policy 6 (1). Pp. 3-16. Springer. https://pure.mpg.de/rest/items/item_1235822/component/file_2086336/content

[80] 1987. Bijker, W., E., Hughes T. P., Pinch, T. (Ed.): The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology. London, Cambridge, MA: MIT Press 1987.

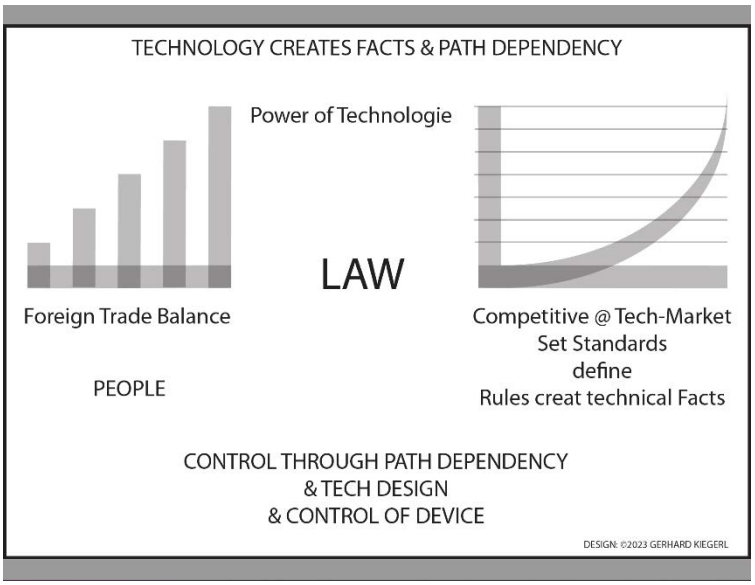

Figure 6: Technology creates Facts and Path Dependency. Astrid Bötticher. Design: Gerhard Kiegerl.

In short, technopolitics is a strategy for gaining and maintaining power between political system rivals that is based on political use of technology or distribution of technology that has its own agency[81]: Technopolitical means are used to try to gain maximum power through the strategic distribution of digital products, development of new technologies, defence against technopolitical influences from outside. The politically forced sale of "core digital technologies" (be they applications in the social media sector, the provision of platforms for e-commerce, the sale of software or hardware, but also "tangible structures" of digital services of general interest such as the targeted provision of satellite communications), are important milestones in a strategy for political power and influence that also works with the means of standardization.[82]

Technology does not only set up economical facts but have become a political fact as Ulrike Franke and José Torreblanca have put this: “Technology regulation may sound like (and, to some extent, is) a boring topic that should chiefly concern legal experts. But

[81] A full explanation of what a technology agency is can be found in a later chapter.

[82] Nantulya, P.: Grand Strategy and China’s Soft Power Push in Africa. Africa Center for Strategic Studies. https://africacenter.org/spotlight/grand-strategy-and-chinas-soft-power-push-in-africa/ See also: Fedasiuk, R.: Building a Silicon Bulwark: How the United States and Taiwan Can Retain Joint Leadership of the Global Semiconductor Industry. Center for a New American Security Technology. https://www.cnas.org/publications/commentary/building-a-silicon-bulwark-how-the-united-states-and-taiwan-can-retain-joint-leadership-of-the-global-semiconductor-industry.

technology has found its way onto geopolitical battlegrounds. Throughout history, technology has not only transformed economies and societies but also been a major redistributor of power among states and a significant force shaping and reshaping international relations. New technologies can massively boost a country's economy and, therefore, global influence. They can enable capabilities that provide a country with military advantages or even dominance. And the values and standards that tech products embody are determined by whoever manufactures them."[83]

The specification of a standard for instance, is today an important gateway of political influence of power in a decentralised "network governance".[84] The strategic implication of political action sits alongside the influence of institutional regulatory frameworks, be it an algorithm or a software architecture, or a formal, law-based regulatory framework at the national or international level that can be traced as network governance.[85] In this context, the term "regulation" leaves our traditional conceptual field, because regulation can be created by product design as well as by classical regulation through framework conditions such as standardisation and legislation.[86]

The concept of technopolitics refers originally to digitalisation and the strategies initiated by policymakers to address the challenges it poses:

"By adopting the notion of technopolitics, we argue that it is neither sufficient to treat sciences and technologies as external to 'social' relations, nor as dominating human behavior and determining political outcomes."[87]

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[83]Franke, Ulrike, Torreblanca, José Ignacio: Geo-tech politics: Why technology shapes European power. Policy Brief. European Council on Foreign Relations. 15.07.2021. https://ecfr.eu/publication/geo-tech-politics-why-technology-shapes-european-power/

[84] For instance: Gasser et al.: 2011. Gasser, Urs, Burkert, Herbert, Thouvenin, Florent, Nolan, Caroline: ICANN: Observations from an Information Law Perspective. In: Sethe, Rolf et.al.: Kommunikation Festschrift für Rolf H. Weber zum 60. Geburtstag. Bern. Stämpfli Verlag AG. Pp.: 469-497. https://www.rwi.uzh.ch/dam/jcr:bd7025d4-5ed5-46f1-bb2b-5384ed907f27/2011%20Gasser-Burkert-Thouvenin-Nolan%20-%20ICANN.pdf Last Access 11.04.2022.

[85] 2007. Börzel, T., Panke, D.: Network Governance: Effective and Legitimate? In: Sorensen, Eva: Theories of Democratic Network Governance. Basingstoke, Hampshire. Palgrave Macmillian. P. 153-168.

[86] 2022. Carolyn Ten Holter: Participatory design: lessons and directions for responsible research and innovation, Journal of Responsible Innovation, 9:2, 275-290, DOI: 10.1080/23299460.2022.2041801. See also: Alexander Peukert and Matthias C. Kettemann: The Law of Global Digitality: Introduction. Alexander Peukert and Matthias C. Kettemann (Ed.): The Law of Global Digitality. Milton Park, New York. Routledge 2022. P. 1-13.

[87]Op. Cit. Mayer, M., Carpes, M., Knoblich, R. 2014. P. 2.

Technopolitics is defined by Mayer as an umbrella term describing the links between technology and science, and as a boundary term describing overlapping research agendas. The term is concerned with technology-based political power and is seen in this context as an approach to the study of the development of international political economy.[88] While Timothy Mitchel uses the term technopolitics to refer to the rule of experts who govern independently, Mayer's term refers to experts and products that are put in place for political reasons to pursue higher political goals that they have not defined, but are merely entrusted to them.[89] The term highlights the contingent dynamics of innovation processes and their impact on the formulation (and success) of industrial and innovation policies. National innovation systems operate within a global system of technopolitics.[90]

Technopolitics refers to the relationship between technology and political power, and considers technology as a tool to achieve political goals. It is important to stress that regulation can take place not only through formal rules such as standardisation and legislation, but also through product design.

Technopolitics is a field that links political and economic power in relation to technology and innovation. The complexity of the relationships between technology, politics and economics and the different actors involved, such as governments, corporations and experts in the field, draws attention to the question of how they act. If regulation can take place not only through traditional legal frameworks, but also through product design and standardisation, then processes at the middle management level, such as standardisation organisations, involve local developers in central policy processes, the impact of which should not be underestimated and which have a previously unknown relevance. Technopolitics refers to the relationship between

[88]Op. Cit. Mayer, M., Carpes, M., Knoblich, R. 2014 P.18.

[89] 2003. Mitchell, Timothy: Rule of Experts - Egypt, Technopolitics , Modernity. Berkeley: University of California Press, 2003.

[90] 2001. Barry, A.: Political machines: Governing a technological society. London: Athlone Press. 2016. See also: Cullather, Nick: Explaining the History of American Foreign Relations. P. 102 - 118. In: F. Costigliola, F., Hogan, M. (Eds.): Explaining the History of American Foreign Relations. Cambridge: Cambridge University Press.

DOI: https://doi.org/10.1017/CBO9781107286207.007

technology and political power and considers technology as a tool to shape the relationship between technology, science, business and politics and to influence the success of industrial and innovation policies. This has implications for the relationship between the US, China and the EU in the global competition for technology and innovation.

4.1. Technology Development and Technopolitics

Today, despite the debate on Society 5.0 and on how to become such or what are countries, whose level of development already corresponds to, we live in the 'information society'. The basis of the information society, also known as Society 4.0, is the development of technology - and initially of technology from the information and communication technology (ICT) sector. The information society operates on the basis of the knowledge-based economy.[91] Therefore, investment in technological development and investment into people is becoming increasingly important.[92] However, this has only developed in the decades after the World War, towards sectoral innovation systems.[93] Research funding - that is, the concrete translation of research policy action, has changed in a way that it has been able to establish a knowledge-based economy - a future in which we find ourselves today.

The development from a basic science interest to mission-oriented governance projects can be highlighted describing the case of the USA in a rough picture. Science

[91] Becla, A. (2012): Information society and knowledge-based economy–development level and the main barriers–some remarks. *Economics & Sociology*, *5*(1), 125-132. See also: European Commission: Einheit Europas, Solidarität der Völker, Vielfalt der Regionen - Zweiter Bericht über den wirtschaftlichen und sozialen Zusammenhalt. Report. 31.01.2001. https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/p147_de.pdf. Last Access: 25.02.2022. See also: Żelazny, R. (2015). Information society and knowledge economy–essence and key relationships. *Journal of Economics & Management*, *20*, 5-22.

[92] European Commission: Einheit Europas, Solidarität der Völker, Vielfalt der Regionen - Zweiter Bericht über den wirtschaftlichen und sozialen Zusammenhalt. Report. 31.01.2001. https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/p143_de.pdf Last Access 20.02.2022.

[93] "A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products. A sectoral system has a knowledge base, technologies, inputs and an existing, emergent and potential demand." Malerba, F. (2002): Sectoral Systems of Innovation. *Research Policy* 31. P. 250. See also: Malerba, F. and Orsenigo, L. (1993): technological regimes and firm behaviour. *Industrial and Corporate Change.* **Vol.2 Nr.1.** p. 45-71.

has changed in that its potential for technology development has changed, write Arora et.al., referring to Gordon.[94] First, in the USA in the nineteenth century, in which the scientific bases for later developments were laid, the type of the independent researching pioneer had developed. In this time, basic inventions based on electricity, for instance, were developed. Scientific mavericks invented something fundamental and thus laid the foundation for rapid technological development. Then, however, the organization of science changed, and private companies and mergers became the main drivers of technology development. But especially from the 1920s and into the 1970s, companies built up large research labs and were able to force significant developments - large corporations had research labs with researchers that were Nobel-prize winning and released an impressive number of publications, so that Arora et.al. name this period the "golden age".[95] Acigit et.al. show a more or less steady expansion of corporate research and they analyze the share of patents assigned to corporations. In particular, they can prove a peak in the war years of World War II.[96] Gordon understands the period between the 1920s and 1950s as "great leap forward" regarding the American level of labour productivity. He argues that "under the pressure of a government financed regime that guaranteed fixed margins" have stirred productivity and innovative production processes.[97]

[94] Arora, A., Belenzon, S., Patacconi, A., Suh, J.: The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth. *Innovation Policy and the Economy*, Vol. 20, 2020. Pp. 41.

[95] Arora, A., Belenzon, S., Patacconi, A., Suh, J.: The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth. *Innovation Policy and the Economy*, Vol. 20, 2020. Pp. 41.

[96] 2017. Akcigit, Ufuk, Grigsby, John, Nicholas, Tom: The Rise of American Ingenuity: Innovation and Inventors of the Golden Age. Working Paper. Harvard Business School Working Paper Series. P.2. https://www.hbs.edu/faculty/Pages/item.aspx?num=52130 Last Access 11.04.2022.

[97] 2016. Gordon, Robert J.: The Rise and Fall of American Growth – the US-Standard of Living since the Civil War. Princeton University Press. P. 535- 553. Cit. P.553.

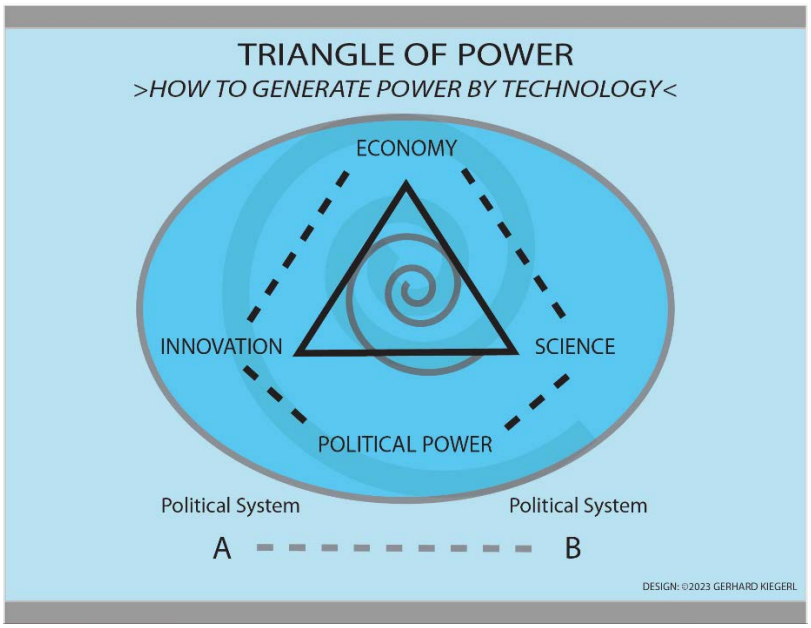

Figure 7: Triangle of Power – How to generate Power by Technology. Astrid Bötticher. Design: Gerhard Kiegerl.

The interest into innovation, science and economic growth as a somehow connected triangle became greater and greater. This natural shift has tended to be reinforced especially by World War II, as Arora et.al. point out: Stimulated by the Second World War, a scientific landscape that still oscillated between basic research and project-oriented research was able to secure the interest of politicians, who had become aware of the enormous potential of science and its return on investment (with inventions like radar, the atomic bomb and industrial produced penicillin, as Arora et.al. state) as war winning innovations.[98] Gordon finds it remarkable that, despite the end of World War II, the U.S. economy did not "buckle" and production did not decrease again, but instead continued to expand. Technical development and research growth, developed shortly after World War II[99] as an economic growth factor, became a portfolio of the technology

[98] Arora, A., Belenzon, S., Patacconi, A., Suh, J.: The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth. *Innovation Policy and the Economy*, Vol. 20, 2020. Pp. 53.

[99] Guellec, D. (2002): Introduction - New Science and Technology Indicators for the Knowledge-based Economy: Opportunities and Challenges. *Science Technology Industry Review.* STI Review No. 27. Organisation for European Economic Co-operation. https://www.oecd.org/sti/inno/introductionstireviewno27newscienceandtechnologyindicatorsfortheknowledge-basedeconomyopportunitiesandchallenges.htm Last Access 22.03.2022.

policy attitude that soon developed stronger and stronger in the USA.[100] The development of a national innovation system progressed and was able to establish itself successfully even without war as a framework condition. National innovation systems are comparable to a machine and consist of a network of institutions in business and government (e.g. ministries, universities and other government research institutions):

> "The system is a mechanism which incorporates inputs and outputs it is predisposed to its own transformation, a machine whose internal configuration and organization can assure a variety of functions. The contribution of science and technology to the development and competitiveness of economies appears to be marked by institutional and organisational factors which ought not to be ignored. Certain studies of an historical character have contributed to the identification of the decisive processes which helped to develop and configurate the institutions in different countries which can be included in the so-called science-technology industry system. Most of these works, however, refer to the United States."[101]

Since World War II, Block and Keller argue, drawing decidedly on work by Glenn R. Fong and Henry Etzkowitz, the role of the U.S. government has increasingly emerged as a coordinator of collaboration partners. According to Paul N. Edwards, it is a "military-industrial complex" that outlasted the Second World War, as the so-called "Cold War" and the construction of ideological blocs manifested themselves quasi directly after it, and technical development remained important for the confrontation with system rivals. Edwards takes a particular look at technical developments at MIT that can be understood as precursors to computer-based defense for instance, and that were stimulated by the government, in particular the US-Airforce.[102] These policy-driven collaborations between private industry, public research institutions, and universities have spread across various manufacturing sectors and have long since left the original context of cooperation, the

[100] Arora, A., Belenzon, S., Patacconi, A., Suh, J.: The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth. *Innovation Policy and the Economy*, Vol. 20, 2020. Pp. 53.

[101] Sanz Menéndez, L., Muñoz, E. (1994): "Technology Policy in Spain: Issues, Concerns and Problems". Published in Aichholzer, G., Schienstock G. (eds.): Technology policy: towards an integration of social and ecological concerns. De Gruyter: Berlin, New York, 1994. Pp.350.

[102] Edwards, Paul N. (1996): The Closed World: Computers and the Politics of Discourse in Cold War America. Cambridge, Mass.: MIT Press, 1996. Pp. 7-12; Pp. 238-240

policy field of defense.[103] In particular, Vannevar Bush's[104] " Science - The Endless Frontier", which has become famous, names natural science as the field of interest that is important for the implementation of political power.[105]

> "New products, new industries, and more jobs require continuous additions to knowledge of the laws of nature, and the application of that knowledge to practical purposes. Similarly, our defense against aggression demands new knowledge so that we can develop new and improved weapons. This essential, new knowledge can be obtained only through basic scientific research. Science can be effective in the national welfare only as a member of a team, whether the conditions be peace or war. But without scientific progress no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world."[106]

Besides the political support of what in our elaboration is called "basic science", Bush describes in particular a project-oriented science, which is application-centered and which he wants to be supported under the aspect of welfare and the general development of society. Here, it is still a matter of politically pushing products that do not serve political power to achieve one's own goals abroad (as is covered by the term Technopolitik), but a general orientation toward the liberal scale of values of a policy whose task is to ensure social prosperity. He describes the state's coordination and allocation of financial resources to medical research during the war and identifies the successes of this effort, which was not so much based on concrete research performance as on open project orientation. He names the individual parts of this as team members. He recommends the development of a committee for the establishment of project-oriented science in peacetime as well.

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[103]Block, Fred, Keller, Matthew R.: Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006. https://itif.org/files/Where_do_innovations_come_from.pdf?_ga=2.162768508.1567400049.1644359715-1591481348.1644359715

[104] Meyer, Michal: The Rise and Fall of Vannevar Bush. July 21, 2018 https://www.sciencehistory.org/distillations/the-rise-and-fall-of-vannevar-bush Last Access 25.04.2022

[105] https://nsf.gov/od/lpa/nsf50/vbush1945.htm Last Access 25.04.2022

[106] https://nsf.gov/od/lpa/nsf50/vbush1945.htm Last Access 25.04.2022.

> "All of the medical and public health groups share credit for these achievements; they form interdependent members of a team."[107]

This is also a European development, as can be shown by Spain and Germany. The development of national innovation systems is a global development, which only the economically particularly weak countries are unable to implement, so that the economic condition in these countries becomes more and more entrenched. The trend toward setting up national innovation systems has become particularly established in the rich industrialized countries. Here, there is apparently an awareness that sovereignty over technological goods offers an important power advantage. In addition to global networking, national innovation systems as a policy technique are important for establishing technopolitical action, because this is where a view of technical superiority in the civil sphere as a means of securing political power becomes entrenched. Sanz-Mendez and Muňoz, looking at the case of Spain, explain in the above cited research paper (in 1994!) that the relation between science and technology "is becoming narrower every day" and that this relationship has deep impact on society and embed this phenomenon into a globally operating "science-technology-industry system" in which policy makers are in the engine room.[108] In a review, the two authors explain the curious absence of research and development issues in the "Pacto de la Moncloa" treaty shaping the transition to democracy. The budget for R&D tasks before the transition to democracy was only 0.3 percent of GDP. Only with the first socialist government was the extensive absence of public policy coordination abandoned, and by 1992 an investment volume of just under 1% of GDP had been achieved. A remarkable fact can be found in the fact that the research and development funding was changed to a project orientation with the second development plan that was in force in Spain from 1968 to 1971.[109]

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[107] https://nsf.gov/od/lpa/nsf50/vbush1945.htm Last Access 25.04.2022.

[108] Sanz Menéndez, L., Muñoz, E. (1994): "Technology Policy in Spain: Issues, Concerns and Problems". Published in Aichholzer, G., Schienstock, G. (eds.): Technology policy: towards an integration of social and ecological concerns. De Gruyter: Berlin, New York, 1994. Pp.349-374.

[109] Sanz Menéndez, L., Muñoz, E. (1994): "Technology Policy in Spain: Issues, Concerns and Problems". Published in Aichholzer, G. Schienstock G. (eds.): Technology policy: towards an integration of social and ecological concerns. De Gruyter: Berlin, New York, 1994. Pp.351-355.

Besides Spain, Germany is an interesting case to highlight this development in Europe. At the end of the 1970s, research and technology policy in Germany was based on a new policy that no longer focused on a pure "basic orientation" but on the "usability of research results".[110] The project-based allocation of funds led to a stronger grip of politics on science and to a politicization of scientific goals in technology development. The focus of science-based research was then transferred to the social legitimacy and economic value. The organization of knowledge was reorganized through the restructuring of funding organizations towards a project-oriented allocation of funds and funding guidelines that were more strongly oriented towards economic exploitability.

> "The reasons for this were in particular -the trend of an increasing demand for usability of research results, -the accompanying change in the knowledge base and the exchange processes between science and industry, especially in new fields of technology [...], -the resulting technology competition, especially between the USA and the other OECD countries." [111]

Since the "great leap forward" as the second Chinese communist 5-year plan under Mao was called, Chinese communism has shown itself to be open to modernization processes. With its strategically oriented selective opening of the economy, which has been in place since 1978, China has step by step ensured a transfer of technology that has enabled the country to catch up. This strategy also includes the acquisition of foreign companies that produce key technologies.

> “From the beginning of economic reform, the Chinese government tried to use the resulting influx of foreign direct investment, to support (and in parts coerce) technology transfer and to thus improve the technological capacity of domestic enterprises. A very common tool of the early years was the obligation for foreign firms to invest in equity joint ventures. The Chinese enterprises involved in these set-ups could thus pick up knowledge and put it to use in their general operations, which proved a very efficient method of learning in the first years.“[112]

Cheung calls the Chinese style of developing a national innovation system “incrementalism”. At the beginning of a interdependent globalization (and the end of history as Fukuyama mentioned) at the end of the 1990s, China integrated strongly into the world market, but

[110]2010. Blümel, C.: Zwischen Innovationsdynamik und Anpassungsstrategien - Wechselwirkungen zwischen Förderorganisationen und Wissenschaft im Feld der synthetischen Biologie. In: Biniok, P. (Ed.): Technology, Science and Politics. Frankfurt Main, Berlin, Bern, Brussels, New York, Oxford, Vienna. Peter Lang. P. 7-22.

[111]Op.Cit. P.8-9. Translation by Astrid Bötticher

[112] Schueler, Margot, Conlé, Markus: New Challenges for Germany in the Innovation Competition. August 2008. Pp. 169.

import liberalization was left out and exports and foreign investment were pursued unilaterally.[113]
Accession to the World Trade Organization represented an important leap in development. For a long time, the Chinese leadership separated the business and research sectors. As a result, hardly any innovative companies were able to emerge, yet this changed step after step starting from the 1980ies. As Eric Kennedy aptly points out, the development of the Chinese innovation system is often met with prejudice. In many cases, today's Chinese innovation success would be explained with the often cited copying and an overbearing state, Kennedy says. The opposite example is often seen in the U.S., where innovation is often not even associated with state action strategies, although the U.S. has developed a rich innovation policy, as the current example of political support for quantum computing, for example, shows.[114] Yet China has recently invested heavily into its knowledge infrastructure development and developed new policy techniques for its knowledge transfer, as Conle´, Zhao and ten Brink proof by analysing technology transfer models in the region of Guangdong.[115]

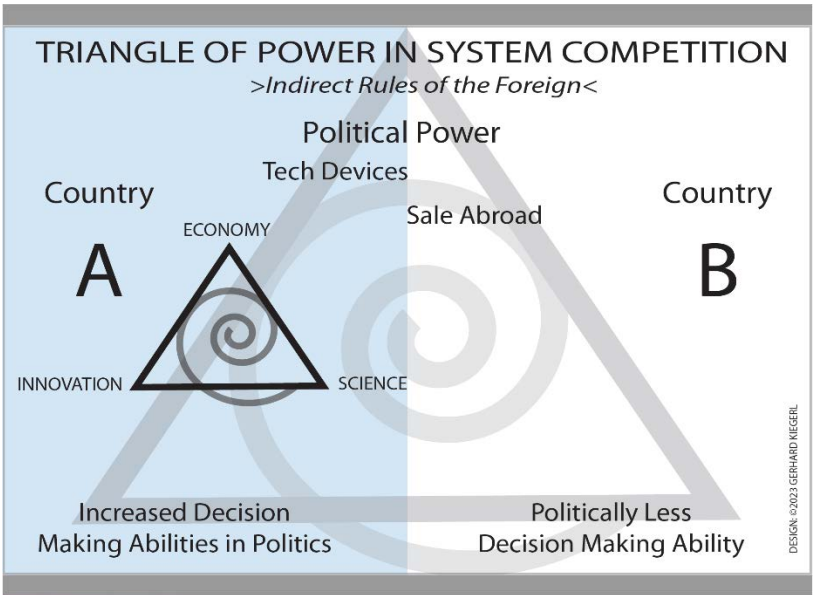

Figure 8: Triangle of Power in System Competition: Indirect Rules of the Foreign. Astrid Bötticher. Design: Gerhard Kiegerl.

Technology yet is not only a power force in systemic rivalry. Due to the design, a technology can have impact on the organisation of cultural life. As we routinely interact

[113] Rodrik, Dani: Globalization for Whom? - Time to change the rules -- and focus on poor workers. Harvard Magazine https://www.harvardmagazine.com/2002/07/globalization-for-whom.html

[114] Kennedy, Eric: Chinas National Innovation System: Learning from a holistic, national Approach to Innovation. *As we now think*. Arizona State University. https://cspo.org/chinas-national-innovation-system-learning-from-a-holistic-national-approach-to-innovation/

[115] Conle´, Markus, Zhao, Whei, ten Brink, Tobias: Technology transfer models for knowledgebased regional development: New R&D institutes in Guangdong, China. *Science and Public Policy*, 2021, Pp. 132–144.

with technology, language changes along with customs, norms, regulations, standards and new social processes. There is a profound literature on technological development that has been developed before and explains the development of technology and the way we speak. For example, Paul N. Edwards has been particularly concerned with the political discourses and social networks that unfold around technically incremental developments and their developers. Edwards has developed a profound theory of novel discourses and speech acts, which he calls "cyborg discourse".[116] The cyborg discourse describes how technology has changed the way we communicate and express ourselves. Edwards argues that the traditional categories and boundaries we use to define language and communication are no longer sufficient in the age of technology, and that our interactions with machines and technology have fundamentally changed our relationship to language and communication. In his book “The Closed World: Computers and the Politics of Discourse in Cold War America”, Edwards argues that computer technology has played a crucial role in the development of modern forms of power and knowledge.[117] Edwards uses Foucault's concept of power/knowledge to show how computers are not just tools for processing information, but also serve as instruments of social control and domination. The roots of cyborg discourse theory can be traced to the sociological theories of postmodernism. One of the key texts by Foucault that has influenced Edwards' work is 'The Archaeology of Knowledge'.[118] In this book, Foucault explores the idea that knowledge is not a fixed entity, but is constructed through discourse and power relations. He argues that power relations are embedded in the production and dissemination of knowledge. Edwards builds on this idea in his theory of cyborg discourse, arguing that as technology and humans become increasingly intertwined, new forms of discourse emerge. He sees these new forms of discourse as challenging traditional power relations and enabling new forms of social and political agency. Edwards argues that the emergence of new communication technologies, such as the Internet and social media,

[116] 1996. Edwards, Paul N.: The Closed World: Computers and the Politics of Discourse in Cold War America. Cambridge, Mass.: MIT Press, 1996. Pp. 19-22.

[117] Op.Cit. Edwards, P.N. 1996.

[118] Michel Foucault: "The Archaeology of Knowledge". Routledge & Kegan Paul: London 1972.

has disrupted traditional power structures and created new forms of discourse and communication that challenge established norms and conventions. He argues that power relations are embedded in the production and dissemination of knowledge and that different forms of knowledge are produced and legitimated through specific discursive practices. Edwards builds on this idea in his theory of cyborg discourse, arguing that technology and humans are increasingly intertwined and that new forms of discourse are emerging as a result. The result of this theory is a call for a more critical and nuanced understanding of how technology is changing the way we communicate, and the need for new frameworks and approaches to address these changes. In "The Closed World" Edwards develops a technopolitical moment, that can be combined with this - although here the focus is still on military technology (which dissolves with Mayer in the context of digitalisation and culminates in a general political mobilisation of technology, if one looks at the concept of technopolitics framed here): Due to external threats to the airspace by hostile states, massive investments have to be made in research and development. The products themselves are then used for defense and serve political purposes.[119]

4.2. Decision, Geoeconomics and Technopolitics

In addition to the conceptualisation of technopolitics as interaction, Mayer et al. introduce a second, independent structural orientation, that of co-production. At the centre of this is the question of the ways in which sciences, technologies and global affairs are co-constituted and co-produced.[120] The connection between technology and power is a two-road lane – those developing technology will determine who is empowered by it.[121] Whoever has access to and control over technology and its development sets incentives, is able to introduce legacies into institutions or sets patterns of behaviour. People are integrated into technical systems in the sense that our

[119] Op.Cit. Edwards, P.N. 1996. Pp. 1-12.

[120] Op. Cit. 2014. Mayer, M., Carpes, M., Knoblich, R. P.3.

[121] Daniel W Drezner: Technological change and international relations. In: International Relations. Vol. 33, Nr. 2. https://doi.org/10.1177/004711781983462

society is already technologised. Institutions, entities, practices and actors are therefore always already divergent from technology. Science, technology and consequently international relations can ultimately be seen as co-constitutive. The strategies of cultural appropriation of technology go hand in hand with cultural influence on technological development.[122] Technological innovation happens as a social process with an ideological level, not as a driver of change.[123] Technological innovation is a trigger for social change, but not an inherently logical and linear development. It is a web of actions and reactions of a multitude of actors in whose network technological innovations take place.[124]

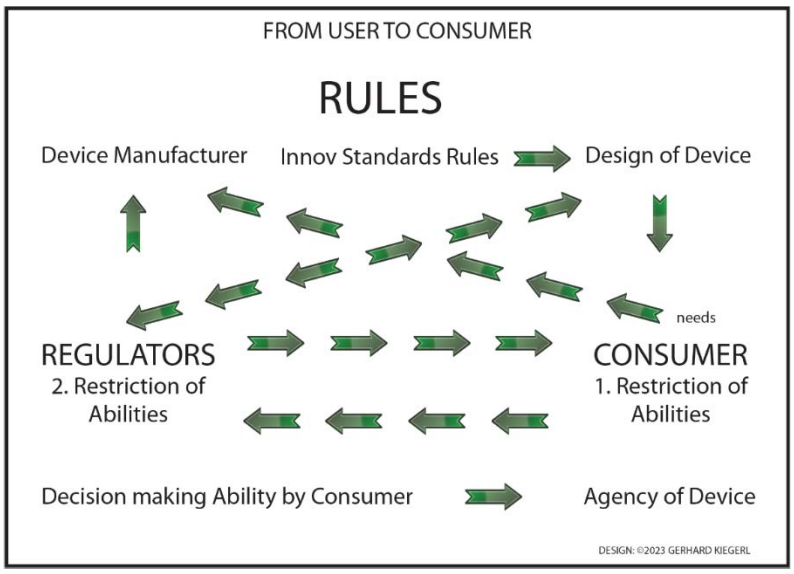

Figure 9: From User to Consumer. Astrid Bötticher. Design: Gerhard Kiegerl.

Technopolitics as a term acquires a specific notion of political action for the purpose of gaining power within technical sites of regulation. Spaces become blurred and are found in issues to be regulated that have significance beyond a region or nation. This can be illustrated by the development of new geo-spaces and this impacts societal

[122]2002. Rammert, Werner: The Cultural Shaping of Technologies and the politics of Technodiversity. In: Sørensen, Knut, Williams, Robin (Ed.): Shaping Technology, Guiding Policy - Concepts Spaces and Tools. Cheltenham/Northhampton: Edward Elgar. P. 93-117. See also: What is digital business transformation? The essential guide to DX. https://www.i-scoop.eu/digital-transformation/

[123]2017. Misterek, Fokko: Digital Sovereignty Technological Utopias and the Demands of Democratic Politics. MPIfG Discussion Paper 17/11. https://www.bildung-forschung.digital/de/technologische-souveraenitaet-2533.html

[124]2019. Hofmann, Jeanette: Mediatized Democracy in Times of Digitalization - A Researcher's Perspective. In: Hofmann, Jeanette , Khersting, Norbert, Ritzi, Claudia, Schünemann, Wolf (Ed.): Politik in der digitalen Gesellschaft Zentrale Problemfelder und Forschungsperspektiven. Bielefeld. Transcript. P. 27-45.

institutions like the law. Technopolitics involves the introduction of new points of control. These are not physical, but technological preconditions for participation.

Amoore and de Goede refer to techniques of social network analysis, the analysis of very large data sets for the purposes of counter-terrorism, but also the analysis of enemies and the political benefits derived from this, which can be linked to the direct instrumentalisation of technology for political purposes. However, this refers to the accumulated dataset based on movements and activities in the network. This use of technology is necessarily transnational, because there is a transnational force in the global data network as a whole.[125] Technology prepares decisions here and who distributes this technology can influence political decisions indirectly. In addition, new decision-makers are emerging at the level of technical-administrative action. This level, where power is exercised, is the main sphere of action. Technology is positioned in such a way that it serves the acquisition of power, even though it is not necessarily directly available to the political power holder.

According to Annegret Bendiek, we are in the "age of digital geopolitics".[126] This means that economies are competing with technopolitical means. This "technopolitical" competition is an important trend within the strategic rivalry between countries and has become a guiding paradigm[127] of international relations.[128] The participants of the dynamic system pass through different control points in the digital world, these are points in a process. These process points are developed on the Internet by a whole range

[125] Amoore, Louise, de Goede, Marieke: Datawars - reflections twenty years after 9/11. Critical Studies on Terrorism 2021, Vol. 14, Nr. 4,p. 425–429.

[126]2019. Bendiek, A, Godehardt, N., Schulze D.: the age of digital geopolitics -.

Europe threatens to become the site of a technological proxy war between the US and China. Journal of International Politics and Society. https://www.ipg-journal.de/schwerpunkt-des-monats/chinas-neue-macht/artikel/das-zeitalter-der-digitalen-geopolitik-3579/

[127]The world's most valuable resource is no longer oil, but data | The Economist 22.03.2022

[128]2020. Perthes, Volker: Dimensionen strategischer Rivalität: China, die USA und die Stellung Europas. Lippert, Barbara, Perthes, Volker (Ed.) Strategic rivalry between the USA and China What it is all about, what it means for Europe (and others). Stiftung Wissenschaft und Politik German Institute for International and Security Affairs. SWP Study 1. P. 5. https://www.swp-berlin.org/publications/products/studien/2020S01_lpt_prt_WEB.pdf Peter Rudolf argues along the same lines. 2019. Rudolf, Peter: The U.S.-China global conflict. SWP Study 23. https://www.swp-berlin.org/publications/products/studien/2019S23_rdf.pdf

of subject matter experts who operate on a point-by-point (local) basis and range from Application Designers to Certificate Authorities to ICANN.[129]

Today, and in the face of political system rivalry that is deeply connected to the distribution of Technology, it becomes more and more clear that decisions for Technology have a political impact. The political aspects of technology are based on the fact that technology (1) reshapes everyday life, (2) shapes the organisation of social institutions, (3) influences institutional change and imposes new or altered constraints, (4) have impact on a nation's wealth.

Therefore, Technology is a public economic issue. It has impact on the rules of the game, the structure of society and its institutional organisation. Digital geopolitics therefore has a domestic and foreign dimension.

"Institutions affect the performance of the economy by their effect on the costs of exchange and production. Together with technology employed, they determine the transaction and transformation (production) costs that make up total costs."[130]

Trade, production, and technology are elements of the cost function in economies. In this context, technology is a kind of constraint that influences policy and business decisions and orientations and thus affects the behaviour of players. Technology changes the behaviour of players and restricts or expands decisions because it is a prerequisite for the process of strategy development - it is a factor that can make decisions meaningful or meaningless. Technology is similar to a rule that defines how a game is played and therefore becomes an influential factor in economic development, as powerful as the legal and political systems.[131]

4.3. Points of power and control

Nazli Choucri and David Clark argue that cyberspace is now a matter of 'high politics' and see it as a source of social vulnerability, a threat to national security and

[129]Op. Cit. 2019. Choucri, N. Clark, P.: P. 168-191.

[130] 1990. Douglass C. North: Institutions, Institutional Change and Economic Performance. Cambridge, Cambridge University Press. P. 5-6.

[131] Ibid. 1990. North. P. 4-5. See also: 2008. Miller, Roger L., Benjamin, Daniel K., North, Douglass C.: The Economics of public Issues. (15. Ed.), Boston, Pearson Education. P. 21- 24.

potential disruptor of international order. Some governments, especially authoritarian ones, would 'shut down' the Internet in face of emerging civil disobedience, cyberattacks would be carried out on entire countries[132], and opposition figures are spied on using Trojans.[133] Choucri and Clark speak of "new patterns of power" that influence strategic policies. To this end, they argue that it is particularly important to consider today's world consisting of social, digital and ecological areas and their strong interconnectedness. We face an integrated system with its own dynamics, setting the conditions for policies.[134] It is an ever-changing network of participants, linked to international relations:

> "Various features of the cyber-IR system are interconnected in largely no reversible ways, in the sense that the 'glue' consists of foundational features of our world as we understand it. Modes of entanglements, state jurisdiction, and differentials in power and leverage connect the cyber and the international domains, and over time, feedback both reinforces and changes the nature of the connections." [135]

However, power and control change in the sense that they form technological gateways, one must first pass to achieve participation. The power obtained through the distribution of technology is characterized by the notion of access control. Control can be indirectly, like the production of a software architecture or directly, like the distribution of systems of control and peering, like Pegasus.[136]Automation is connected to political authority and points of control have become invisible because they are integrated into code:

> "Data do not simply "flow" across jurisdictions and across public and private spheres; they have to be rendered transportable, translatable, and transformable."[137]

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[132]Op.Cit. 2019. Choucri, N., Clark D.D.: Pp. 12-13

[133]https://rsf.org/en/news/german-spyware-company-finfisher-searched-public-prosecutors. German prosecutors investigate spyware makerFinFisher| News | DW | 05.09.2019.

[134]Op.Cit. 2019. Choucri, N. Clark, D.D.: P. 121- 125.

[135]Op.Cit. 2019. Choucri, N. Clark, D.D.: P. 120.

[136] https://www.bbc.co.uk/news/world-europe-57907258 Last Access 19.04.2022.

[137] Amoore, Louise, de Goede, Marieke: Datawars - reflections twenty years after 9/11. Critical Studies on Terrorism 2021, Vol. 14, Nr. 4, P. 427.

4.4. Technopolitics and Innovation

Christopher Freeman, who founded the Science Policy Research Unit at the University of Sussex, developed a view of technology innovation as a strength in the competition between nations.[138] Before, Freemann worked on a general view to policies directed to industrial innovation. Accordingly, the role of the state in directing technological-industrial progress is particularly endowed with a focus on defense.[139]

Technopolitics is about the way that the introduction of new digital technologies creates challenges for politics where technology is changing faster than society can keep up. And actors can take advantage of the politics enabled by digitization to destabilize the international sphere and other parts of the political order. That can lead to risks, especially when the technology is potentially dangerous. This is why a risk-based approach about technology in general and its political meanings in specific has become a new starting point for regulation.[140]

The political coordination of innovation processes forms a background to Technopolitics .[141] Technology became a “mental foil” on which fundamental political decisions are made.[142] This is seen as a state's provision of public services and the safeguarding of prosperity.[143] There is an understanding that innovation is driven by a multitude of actors, and in response, innovation management has changed, as Kopp states, into "Networked patterns of communication and cooperation […]."[144] Flexible innovation networks are collocated in the innovation process through e.g. tenders to

[138] 1987. Freeman, Christopher: Policy and Economic Performance – Lessons from Japan. Frances Pinter 1987.

[139] 1974. Freeman, Christopher: The Economics of Industrial Innovation. Penguin, London, 1974.

[140] https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai

[141] Op.Cit2010. Hahn, K.: Pp. 35-50.

[142] REPORT ¸on the Communication from the Commission to the Council and the European Parliament: Innovation in a knowledge-driven economy (COM(2000) 567 ñ C5-0740/2000 ñ 2000/2336(COS)). https://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+REPORT+A5-2001-0234+0+DOC+PDF+V0//EN

[143] 2011. Howaldt J., Kopp R., Beerheide E. (Innovationsmanagement in der Hightech-Branche - Ein neues Innovationsparadigma?. In: Howaldt J., Kopp R., Beerheide E. (eds) Innovationsmanagement 2.0 - Handlungsorientierte Einführung und praxisbasierte Impulse. Wiesbaden: Gabler.

[144] Op.Cit.: 2011. Howaldt J., Kopp R., Beerheide E.: P.17

international networks. This triangular relationship between governance, economy, and science has become a power plant under the condition of digitalization and deep technology, fueled by technopolitics .[145]

McKelvey emphasizes the importance of science and technology and their multi-directional relationships.[146] The paradigm of science is linked to the notion of innovation, and technology is therefore always linked to diffusion and dissemination: strategic deployment in existing networks, architectures or system entanglements is a basis for international power.[147] In the light of the above, Choucri refers to cyberspace: "if knowledge is power, as commonly argued, then harnessing the power of knowledge becomes an intensely political activity." [148]

In the debate about the right way to promote innovation and make inventions marketable, an innovation policy has emerged that focuses on research policy, economic and industrial policy and education policy. The terms "research funding", "business promotion", "technology development" and "technology competition" are hardly adequate to describe the strategic power component of political-strategic investment in the development of high-tech goods[149], which has become increasingly important under the conditions of digitalisation and in international relations. [150] There are many programs that could be cited, that represent this triade.

Among these, there can be highlighted some on the example of quantum technology and especially quantum computing. The development of quantum

[145]Barbara Brandl sees "knowledge, technology, and institutions in a co-evolutionary relationship to each other". 2016. Brandl, Barbara: Wissenschaft, Technologieentwicklung und die Spielarten des Kapitalismus - Analyse der Entwicklung von Saatgut in USA und Deutschland. Wiesbaden. Springer VS. P. 30. See also: Jon R. Lindsay & Erik Gartzke (2020): Politics by many other means: The comparative strategic advantages of operational domains, Journal of Strategic Studies, DOI: 10.1080/01402390.2020.1768372.

[146]McKelvey, M. (2014). Science, technology and business innovation. In *The oxford handbook of innovation management* (p. 69). Oxford, UK: Oxford University Press.

[147]Xu, G., Wu, Y., Minshall, T., & Zhou, Y. (2018). Exploring innovation ecosystems across science, technology, and business: A case of 3D printing in China. *Technological Forecasting and Social Change*, *136*, 208-221.

[148]2018. Choucri, Nazli, Clark, David D.: International Relations in the Cyberage - The Co-Evolution Dilemma. Cambridge MA. Massachusetts Institute of Technology.

[149]Katrin Hahn distinguishes high-tech industry from low-tech industry by making the research effort the benchmark and associates this with "research-intensive" and "research-poor" firms. Op.Cit. Hahn, Katrin: P. 35.

[150]Op.Cit. 2019. Choucri, N. Clark, D.D.

technologies is considered a strategic priority for many countries, as it has the potential to revolutionise various industries and provide a significant competitive advantage. The US and China are currently leading the way in quantum research and development, and it is crucial for Europe to maintain its competitiveness in this field. The Quantum Technologies Flagship, with its focus on research, innovation and collaboration between key stakeholders in Europe, is seen as a key initiative to achieve this goal and keep Europe at the forefront of this emerging technology. The EU has launched the Quantum Technologies Flagship, a large-scale and long-term research initiative that has received a €1 billion budget, but also smaller initiatives like QUANTERA can be cited here and of course, there are numerous national initiatives that lead to innovation centers like Quantum Delta NL and QuTech initiative (NL) or Munich Quantum Valley (GER) or Quantum Austria. By bringing together research institutions, industry, and public funders, this initiative aims to consolidate and expand European scientific leadership in quantum technologies, and to ensure that Europe remains competitive in this field.[151]

Yet, the not-so-new emphasis on the development of a strong relationship between those, is combined with new areas of political actions within the development of technology and its markets.

4.5. Technology Based Checkpoints as Political Power

The concept of technopolitics highlights the ways in which technology and digital environments can be used to gain or maintain political power on a global scale. In the context of the platform economy, companies such as Uber, Airbnb, Apple and Google control the digital platforms and set the standards for how they operate, which can give them significant power over the flow of goods and services and knowledge in the global economy. Whoever develops the checkpoints and decides on the design can exercise control. In the context of the platform economy, the power based on the setting of

[151] For an overview from 2022 please look at: Overview on quantum initiatives worldwide - update 2022 - Qureca

checkpoints has become apparent once again. A concrete example of this control technique is described by Choudary, who portrays the platform economy and Google:

> "Platforms like Uber and Airbnb, and Apple and Google's app stores, do not provide tangible goods to their customers. [...] Successful platforms also create points of control. [...] By controlling Android and the App Store, Google sets the standards for how the ecosystem works and what apps appear in it." [152]

Al-Ani describes the platformisation of state action as a very general trend in digitisation. Different actors set the points of control.[153] The points of control thus define participation - the who, how and what of participation. The control that now emanates from a private actor has a leverage effect that is important for policy change under the conditions of global digital markets:

> "And as trade, labor, and money are increasingly digitized and exchanged through platforms, countries must rethink their position in the global flow of these goods. If they want to gain a competitive advantage, countries must increasingly adopt a platform strategy." [154]

This can be applied to the technological world as a whole: Those who succeed in dictating their selective (local) technical standards to the world control behaviour at the global level and can also create dependency at the political level.[155] This insight is already being translated into policy strategies as Choudary remarks:

> "Much like Google has established itself as a dominant player in the smartphone ecosystem, China is seeking to do the same in an increasingly digital geopolitical landscape. [...] China's National Informatization Strategy calls on China's Internet companies to go out into the world and support the creation of a "Digital Silk Road" - which refers to the export of Chinese technology under the Belt and Road Initiative (BRI), China's massive global infrastructure project. With

[152]2020. Choudary, Sangeet Paul : China's Country-as-Platform Strategy. https://www.brookings.edu/techstream/chinas-country-as-platform-strategy-for-global-influence/

[153]2016. al-Ani, Ayad: Is resistance possible? Sovereignty in Business and Politics. In: Friedrichsen, M., Bisa, P.-J. (Ed.): Digitale Souveränität - Vertrauen in der Netzwerkgesellschaft. Wiesbaden. Springer VS. P. 67-79.

[154]Op.Cit. 2020. Choudary, S.P.

[155]Op.Cit. 2019 Choucri,N., Clark P. 119.

> the "Digital Silk Road," China is focusing on a "land-as-platform" strategy. [...] Public and private actors in China are working closely together under a country-level platform strategy to build digital infrastructure that is consistent with the BRI, to promote standards that drive the adoption of such infrastructure, and to strengthen China's points of control in the digital economy. This strategy spans four key themes: Commerce, Payments, Smart Cities, and Social Credit. If successful, this strategy could fundamentally shift trade and financial flows toward a China-centric economic order and even reshape the political systems of participating countries. " [156]

An example is China's Digital Silk Road, which uses Huawei technology on the basis of smart city contracts. Huawei has sold unique products to Pakistani law enforcement agencies, enabling facial recognition, number plate recognition and social media monitoring. But Pakistan also relies on Beidou satellite navigation (which can guide missiles, ships and aircraft), which underpins a remarkable amount of critical digital infrastructure, from intelligence to military. A major digital dependence of Pakistan is the result of the strategic offer of Chinese technology through its Digital Silk Road initiative.[157] By providing security technology that follows a Chinese software architecture, it represents Chinese leverage points.[158] The provision of digital infrastructure, like any other deep technology, can be used for political bargaining and can no longer be understood solely as 'market power' through global leadership or in the other usual terms of economic policy. Power through control of network infrastructure (through provisioning) is, in abstract terms, power through control of control points.

Al-Ani describes the platformisation of state action as a general tendency of digitisation, where different actors set the control points and define participation. In this way, the control that now emanates from private actors has a leverage effect that is relevant to policy change under the conditions of global digital markets. This insight is already being translated into policy strategies, such as China's National Informatisation

[156] Op.Cit. 2020. Choudary S.P.
[157] https://www.csis.org/analysis/watching-huaweis-safe-cities Last Access 19.04.2022
[158] MGI-Chinas-digital-economy-A-leading-global-force.pdf (mckinsey.com)

Strategy, which calls on China's Internet companies to support the creation of a 'Digital Silk Road' and to promote standards that drive the adoption of Chinese technology. If successful, this strategy could fundamentally shift trade and financial flows towards a China-centric economic order and reshape the political systems of the countries involved. Another example is the Chinese boom in 5G products: the Chinese company Huawei has registered the most patents in the field of 5G products (as of 2020). The standard for 5G was developed by the 3rd Generation Partnership Project (3GPP), whose founders included the French, British and Italian telecoms companies - Huawei was also involved in the project. The Chinese group is the largest supplier of 5G infrastructure and wanted a strong position in the European market. This was prevented for political reasons to avoid dependencies. Critics feared that the control introduced by the 5G infrastructure could have a political impact.[159] This could have political leverage and create dependency at a political level, which is why it has been prevented in some countries for political reasons to avoid dependency.

4.6. Standardisation

Understanding technology in the context of the concept of technopolitics finds a connection to the geospatial – and it is interwoven into the concept of a knowledge-based market.[160] This change towards a new form of influence via local action in the field of technology is described by Disco and Van der Meulen as early as 1998:

> "Rather than following the dictum 'think globally and act locally,' actors seeking to steer technologies - especially non-state actors - would be better encouraged to "think locally and act globally." The goal then is to influence technology development by influencing global orders in such a way that local actors adapt their practices on their own." [161]

[159] Huawei ban: UK to impose early end to use of new 5G kit - BBC News Last Access 25.03.20222 Huawei: Which countries are blocking its 5G technology? - BBC News Last Access 23.02.2022

[160] https://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/p147_de.pdf Last Access 12.12.2021

[161] 1998. Disco, Cornelis, Van der Meulen, Barend: Getting Case Studies Together: Conclusions on the Coordination of Sociotechnical Order. In: Disco, Cornelis, Van der Meulen, Barend (Ed.): Getting New Technologies Together. de Gruyter Studies in Organization No. 82. Berlin, Boston. De Gruyter. P. 323-351 (349)

The consideration that local action can have global significance is central to setting standards, for example, or the architecture of technical systems like software.[162] This is a starting point for technology-related power politics. The meaning and purpose of the design is in the foreground, as Schulze and Voelsen point out: what was previously referred to as "interdependent entanglement", understood as unproblematic interaction, is today linked to the notion of a power strategy related to technical change.[163] Technopolitics - unlike technology or science policy - is no longer intended to refer merely to the fact that a location is in international competition, or that (national) companies are in international competition. Rather, it is a trial of strength between political system competitors, which also takes place at local technological intersections. The conditions of digitalization and its significance for state action are central factors in the transformation. Technopolitics is described as "digital geopolitics" by Bendiek et. al:

> "Digital geopolitics combines two opposing trends in international politics. On the one hand, digital geopolitics is based on the power politics of territorial entities, such as nation-states like the United States and China, or regional actors like the European Union. On the other hand, digital geopolitics involves decentralized transnational networks consisting of connections between non-state actors and multinational corporations, platforms, nodes, content, and infrastructures beyond politically defined territorial entities.“ [164]

The technological dimension of power is characterized by de-territorialization under the condition of networks: Schulze and Voelsen conceptualize this as "technopolitical spheres of influence of digitalization" and explain that

> "Technopolitical spheres of influence differ from this in the characteristics of digital technologies. On the one hand, digital services and products are based

[162] 2020. Silke Wettach, Thomas Kuhn: How China is usurping technical standards worldwide - Beijing's DIN standard. Wirtschaftswoche. 02.05.2020. https://www.wiwo.de/my/politik/ausland/pekings-din-norm-wie-china-weltweit-technische-standards-an-sich-reisst/25785506.html?ticket=ST-3493562-giXSsS1tPXahYCmoxoXs-ap5

[163] 2020. Schulze, Matthias, Vogelsen Daniel: Spheres of Influence of Digitalization. In: Lippert, Barbara, Perthes, Volker (Ed.): Strategische Rivalität zwischen USA und China - Worum es geht, was es für Europa (und andere) bedeutet. https://www.swp-berlin.org/publications/products/studien/2020S01_lpt_prt_WEB.pdf P. 30-36.

[164] Op.Cit. 2019. Bendiek, A., Godehardt, N., Schulze D.

> on the combination of different levels of hardware and software. For another, many of the digital technologies that are crucial here are subject to network logic." [165]

The geospatial dimension makes local/specific/concrete action in the context of technology development a potentially globally weighty action that could be capable of providing leverage for political power. A fundamental aspect of this shift of local and global meanings is the setting of technical standards, as it brings immense advantages, as Weithmann describes:

> "While standardization mainly favors standard-setters, the standard-takers, being mainly developing countries, are at a disadvantage. Various aspects, such as entrenched intellectual property issues or the speed of technology development, make it difficult for developing countries to overcome this disadvantaged position." [166]

Code is law, they said in the 2010s. But standardization as a prerequisite to the development of (industrial) technology devices and infrastructure also is. This can be seen looking at the example of quantum technology standardisation. The new standardization strategy of the EU also requires the involvement of international standardization organizations such as ISO or ITU, as Heise remarks.[167] The reform of the standardisation system ensures that European interests are taken into account when the Commission awards standardisation contracts. The reform concerns the European Telecommunications Standards Institute (ETSI), the European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC).[168] The QT standardisation body "CEN/CENELEC Focus Group Quantum Technologies (FGQT)" also acknowledges the link between local standardisation and

[165] Op.Cit. 2020. Schulze, M., Vogelsen D.: P. 30-36.

[166] 2018. Weithmann, Sabrina: The Evolvement of Standards in China - Insights from the Electric Vehicle Sector. China - Politics and Economics Vol.1., Baden-Baden. Nomos. P.121.

[167] https://www.heise.de/news/Standardisierung-EU-Kommission-beansprucht-Fuehrungsrolle-Europas-bei-Normen-6346558.html

[168] "Proposal for a Regulation amending Regulation (EU) No 1025/2012 as regards the decisions of European standardisation organisations concerning European standards and European standardisation deliverables." DocsRoom - European Commission (europa.eu)

global political power play when it speaks of a quantum race and links standardisation efforts to geopolitics[169] as it notes: “This will facilitate the transfer of QT from research to market, from a European perspective and regarding the development worldwide“. The definition of standards may be a European initiative, but its design has a global impact.[170] Here we see that local actions transform into political power with global impact

This also might have been an answer to Chinese efforts in developing standardisation as geopolitical power play issue.[171] China has developed a strategy in its “China 2035” strategy on how to develop power by engaging in standardising commissions.[172] And the rivalry between China and the US has materialised in the field of standardisation development, which has recently been dramatised by the public, as we can see when Asia times calls it: "US-China in a war for tech standards supremacy".[173]

The international relations concept of technopolitics is concerned with a style of politics that uses the new framework conditions of digitalisation to gain power and whose strategic political coordination is found in the implementation of material projects in the field of technology, such as political-strategic interference in processes to create regular preconditions for the use of technology. China, in particular, has developed a planned strategy for this purpose, adapted to its political goals and economic needs, which can be linked to the planning of power through the setting of control points, expressed in the Belt and Road Initiative (BRI), and power through the setting of standards.[174] One of the guidelines of this strategy is to achieve "stability through peaceful development". As early as 2013, China developed a concept that embraces the idea of transnational interdependence in the high-tech sector, on the basis of which it

[169] CEN-CENELEC Focus Group on Quantum Technologies (FGQT): Standardization Roadmap on Quantum Technologies. 03/2023 p. 17. fgqt_q04_standardizationroadmapquantumtechnologies_release1.pdf (cencenelec.eu)

[170] Kop, M., Aboy, M., De Jong, E. et.al.: Towards Responsible Quantum Technology (March 17, 2023). SSRN: https://ssrn.com/abstract=4393248 or http://dx.doi.org/10.2139/ssrn.4393248

[171] Chinese tech standards put the screws on European companies | Merics

[172] Missing Link: Wie sich China zur Normungsweltmacht aufschwingen will | heise online

[173] US-China in a war for tech standard supremacy – Asia Times

[174] 2021. Schneider, Florian: Global Perspectives on China's Belt and Road Initiative - Asserting Agency through Regional Connectivity. Amsterdam University Press.

intends to negotiate with major powers. The BRI is a trade project with a geopolitical dimension, says Godehardt.[175]

This policy direction comes at a time when the rise of the internet and communications industry has gained momentum. But we see orchestrated policies that go beyond digital markets. One of the "five openings" associated with the BRI is the development and expansion of technological infrastructure in China and neighbouring countries. A functioning infrastructure has been seen by China as central to development and a prerequisite for further development.[176] The BRI has a planned investment volume of US$8 trillion by 2049, with infrastructure projects such as the construction of power plants, mines, processing plants, bridges, highways, ports and railways at the heart of the investment.

In addition to the export of Chinese infrastructure, Schneider says the focus is on developing trade facilitation through bilateral trade agreements.[177] Bringing in technological infrastructure has the consequence that infrastructure already has local standards that are manifested outside of China.

> "The terrain for all future technological competition is set through standards setting and subsequent adoption of these technologies by users and developers, who then build other applications and services on top of these technologies or platforms."[178]

Standards and norms have already been set through the politically forced provision of technical infrastructure.[179] However, standards are not set solely through the politically enforced distribution of classical infrastructure; standard-setting processes play a role throughout the industrial sector, and especially in the knowledge-based economy, which

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[175]2014. Godehardt, N.: China's "New" Silk Road Initiative Regional Neighbourhood as the Core of Chinese Foreign Policy under Xi Jinping. SWP Study. P. 7. https://www.swp-berlin.org/publications/products/studien/2014_S09_gdh.pdf

[176]The intensification of political dialogue among Silk Road states, improving infrastructure, strengthening trade relations, removing barriers to the free flow of currency, and expanding of cultural exchange. See: Godehardt (Op. Cit.) 19-20.

[177]https://www.businessinsider.in/international/news/china-loses-wto-dispute-against-eu-for-market-economy-status/articleshow/76494302.cms

[178]https://www.gmfus.org/news/technological-leadership

[179]http://www.bbc.com/future/bespoke/specials/connected-world/government.html

has a political leverage effect. The Bundesverband der Deutschen Industrie (BDI), for example, writes about the changing nature of standard-setting that formerly technical processes and the technical specialists entrusted with them are now confronted with politically strategic behaviour.[180] The idea of taking a leading role in standardisation in the digitalisation process is also reflected in "China Standards 2035". Chinese standards are expected to be manifested in future technologies such as the Internet of Things, 5G Internet, artificial intelligence and cloud computing.[181] The political significance of previously technical, local, and concrete influences, which were developed by technical expertise independent of various industries, changed, integrating them into a political power strategy. [182]

A fundamental aspect of this power shift, which is described by the term technopolitics, is the setting of technical standards, which can bring immense benefits to those who set the standards. Standardisation mainly favours the standard setters, while the standard takers, often from developing countries, are disadvantaged. Various aspects, such as entrenched intellectual property issues or the speed of technological development, make it difficult for developing countries to overcome this disadvantage.

China has developed a deliberate strategy to this end, adapted to its political objectives and economic needs, which can be linked to the planning of power through the establishment of checkpoints, as expressed in the Belt and Road Initiative (BRI), and

[180]BDI: Chinese Creative Drive: China Standards 2035. Aug. 13, 2020. https://english.bdi.eu/article/news/chinese-creative-drive-china-standards-2035/#:~:text=Chinese%20Creative%20Drive%3A%20China%20Standards%202035%201%20Self-developed,the%20development%20of%20a%20third%20standardization%20system.%20

[181]https://www.cnbc.com/2020/04/27/china-standards-2035-explained.html

[182]For example, the German Engineering Federation writes on its website about the changing importance of standardization activities: "In China, it was recognized years ago that Chinese participation at the level of the international standardization organizations ISO and IEC does not correspond to the country's increasing economic importance. Therefore, significant efforts have been made over the past decade to increase its presence in international standardization. Initially, this mainly related to the assumption of leadership positions in standardization bodies (technical committees). In the relevant statistics, China now ranks third behind the USA and Germany. The picture is more differentiated at the lower level of working groups, in which the actual technical standardization work is carried out. Here, due to massive state support, Chinese initiatives are increasingly being seen, particularly in those areas of standardization which are defined by the state as priority topics. Increasingly, attempts are being made to introduce national Chinese standards as the basis for an international standardization project. In other areas, Chinese activities continue to be limited or do not go beyond mere observer status. "VDMA: New standardization strategy "China Standards 2035" http://normung.vdma.org/viewer/-/v2article/render/50001829.

power through the establishment of standards. One of the guidelines of this strategy is to achieve "stability through peaceful development". In 2013, China developed this concept that incorporates the idea of transnational interdependence in the high-tech sector, on the basis of which it intends to negotiate with major powers. The politically enforced provision of technical infrastructure has already set standards and norms. However, standards are not set solely through the politically enforced distribution of classical infrastructure; standard-setting processes play a role throughout the industrial sector, especially in the knowledge-based economy, which has a political leverage effect. Considerations regarding a leading position in standardisation in the context of digitalisation processes can also be seen in the "China Standards 2035".

The political significance of what were previously technical, local and concrete influences, developed through technical expertise independent of different industries, is changing and being integrated into a political power strategy. We see cross-domain influence through the back door of management-level processes in the international environment, whereas normally in international relations cross-domain deterrence is a central theme. So there is a shift in interests here as well.[183]

4.7.Digital Sovereignty and Technopolitics within political strategies

In describing the individual measures by which we can see that technopolitical tendencies are becoming more and more important, we also see whole political strategies that relate to power through the development of technology, its design, its application. Standard-setting, the instalment of technological infrastructure, technological monopolies, and migration of technical dynamics have not only a huge impact on the catching-up process of emerging economies.[184]

In addition to the placement of technological goods abroad, political protection from foreign (developers, providers, buyers) are related to the concept of technopolitics as they can be understood as counter-measures that are normally referred to as digital

[183] Demchak, C. (2019). Cross-Domain Deterrence: Strategy in an Era of Complexity. Edited by Erik Gartzke and Jon R. Lindsay. Oxford: Oxford University Press, 2019. 408p. $99.00 cloth, $34.95 paper. Perspectives on Politics, 17(4), 1254-1255. doi:10.1017/S1537592719003542

[184] Op. Cit. Mayer, M., Carpes, M., Knoblich, R. 2014 p. 22-23.

sovereignity or technical sovereignity.[185] Technopolitics is intertwined with several concepts developed and promoted by nation-states to secure power in the technological sphere. Three major powers, the People's Republic of China, the United States of America and the European Union, dominate the global market and have also been in fierce competition with each other in terms of political systems since China joined the World Trade Organisation in 2001 and emerged as a major competitor to the European Union and the United States of America. China is in a "trade and technology war" with the US, as we read in the mass media. What is meant is an intensified competitive situation in which the competing countries find themselves, and from which the EU is not entirely exempt. In this triadic constellation, each is part of a relationship and at the same time an observer of the relationship of the others.

The competition between the US, China and the EU in the world market and their political systems form the power-political environment in which technopolitics takes place. In this competition, innovation systems and their impact on the formulation of industrial and innovation policy have become more important. This justifies technopolitics as an important factor in the global political economy, influencing innovation processes and their effects in economies and political systems and its institution like the development of soft law. The US responds to foreign takeovers (and to the Chinese strategy of control through inspection and standard-setting, both of which tend to create dependency) by closing the market or banning activity in the US market.[186] But they also “decouple” the American economy from China.[187]

First, digital sovereignty describes the decision-making authority.[188] However, technological sovereignty is also about users in a second step. Any kind of technological innovation, while a driver of development, is characterised by the reciprocal influence of the society in whose institutional framework it is situated. It is a web of actions and

[185] See also: 1992. Callon, M.: The dynamics of techno-economic networks. In P. Saviotti, R. Coombs, & V. Walsh (Eds.), Technological change and company strategies (pp. 72–102). London: Academic Press.

[186]https://www.dw.com/de/chinas-gro%C3%9Fer-sprung-zur-hightech-macht/a-43692953

[187] Prepare for the U.S. and China to Decouple (hbr.org)

[188]2017. Bogenstahl, Christoph, Zinke, Guido: Digitale Souveränität - ein mehrdimensionales Handlungskonzept für die deutsche Wirtschaft. In: Wittpahl, Volker (Ed.): Digitale Souveränität - Bürger, Unternehmen, Staat. Berlin, Heidelberg. Springer Vieweg.P.65.

reactions by a multitude of actors in whose network technical innovation takes place. In short, firms, public authorities and society not only need infrastructure, but they also need people who can operate it. Alongside this is civic sovereignty in the network - these places ethically based demands on technical systems - ranging from transparency requirements for digital environments to the ability of individuals to control their data and its use, to the imperative not to use certain technologies to implement notions of political system security, as is followed by China with the consistent use of artificial intelligence. China has developed a notion of security that is congruent with a rather classical idea of state sovereignity.[189] This is also related to the social acceptance of the use of digital technology for surveillance and behavior correction purposes. Here you can clearly see how much technology depends on the society in which it is created. [190]

The focus group "Digital Sovereignty" of the Digital Summit 2020 of the Federal Ministry for Economic Affairs and Energy of Germany briefly describes the complexity of sovereignty in the global data network. It addresses the fact that this is not infrequently about mutual dependencies and that unilateral dependency is only one manifestation of dependency.

> "In the context of digital sovereignty, dealing with dependencies is a central moment. Fundamentally, sovereignty aims at the ability of self-determination. Dependencies that undermine this ability can be called unilateral dependencies. Opposed to this dominance are mutual dependencies, which do not affect the question of sovereignty or affect it to a lesser extent, since one side cannot exercise dominance over the other. In addition, there are multilateral dependencies, where there may be multiple dominance and which are very difficult to resolve in terms of reciprocity." [191]

[189]2020. Paaß, Gerhard, Hecker, Dirk: Künstliche Intelligenz - Was steckt hinter der Technologie der Zukunft? Springer Vieweg. P.413-416.

[190]https://www.deutschlandfunkkultur.de/kuenstliche-intelligenz-in-china-die-supermacht-der.979.de.html?dram:article_id=439978

[191]Digital Sovereignty Focus Group: Digital Sovereignty and Resilience: Prerequisites, Drivers and Measures for Greater Sustainability. https://www.de.digital/DIGITAL/Redaktion/DE/Textsammlung/digital-gipfel-plattform-digitalisierung-der-wirtschaft-fg1.html

Digital sovereignty has thus inscribed something that is the central basis and prerequisite of our self-regulated society - the state as sovereign - which in our modern society is largely dependent on social self-regulation, must intervene in a regulatory manner to stabilize itself. But this implies a tremendous consequence: digital sovereignty is a public matter. Digital sovereignty becomes a public good. In [192]essence, the sovereign endowed with democratic power, whether at the nation-state level or at the transnational level of the EU, wants to establish law enforcement, build state control capacity, and focus on regulating technical innovations on a global scale so as not to risk unilateral dependencies in the provision and application of technical products that turn out to be indispensable for the digital society and its knowledge-based economy and are linked to political power. In the process, various processes occur in parallel and form a system of interrelated developments.

Technological standard-setting as an individual measure for instance, is related to the concept of technological sovereignty, because we can understand technological standards as a local technological design that has a global impact. And we have seen that today nations compete fiercely to set a standard and rule the development of technology devices. Technological sovereignty refers to a country's ability to control and regulate its own technological environment, including the ability to produce its own technologies and set its own standards. It is precisely here that the policy processes have come into focus, because how the concept of national technical sovereignty is constructed and what forms of governance are represented with it is strongly tied to the fundamental political conception of the participants. The use of one's own technological standards and devices by non-competing political systems seems to be a kind of defensive security approach.

Technical standard-setting is a key aspect of technological sovereignty, as it allows a country to set the standards for how technologies are developed, used and integrated into society. This can give a country greater control over its technological environment

[192]2020. Steiner, F., Grzymek, V.: European Public Goods - Digital Sovereignty in the EU. Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/de/publikationen/publikation/did/digitale-souveraenitaet-in-der-eu-all

and help ensure that its interests and values are reflected in the technologies used within its borders. In this way, countries that can set their own standards for technologies and control their own technological environment may be able to exert greater influence on global technological developments and be less dependent on other countries for technology. On the other hand, countries that are unable to set their own standards and control their own technological environment may be at a disadvantage, as they may be forced to adopt technologies and standards that are not in line with their interests and values. The setting of technical standards is therefore a key aspect of technological sovereignty, as it allows countries to exert greater control over their technological environment and to ensure that their interests and values are reflected in the technologies used within their borders.

While all of today's participants in the technological race are striving to exercise sovereignty and also to explain their interests to common rule-making bodies, we see that there are different views on the concept, although the tendency to protect oneself from technological interference is common to all. Europe has developed a very different approach to 'digital sovereignty' and depicts a strategy to fight back against 'cyber sovereignty' as a modus operandi of technopolitics . The central political buzzword in this context is "technological sovereignty".

> "We must detach the concept of digital sovereignty from the purely territorial level and expand it to include a substantive, qualitative dimension. Our image of humanity and our social as well as economic future demand - against the backdrop of global digitalization - new patterns of behavior, new approaches to solutions, such as hardened process architectures, excellent process management or new standards that are based on our own foundations, on our own competencies and that at the same time take the international context into account." [193]

[193] 2020. Friedrichsen, M., Bisa, P.: Introduction - Analysis of digital sovereignty on five levels. In: Friedrichsen, M., Bisa, P. (Ed.): Digital Sovereignty - Trust in the Network Society. Wiesbaden. Springer VS. P.1.

We can see here that political values like democracy, openness, free civil engagement and multitude-organisation of technological/digital infrastructure is connected to a political frame within technological regulation. According to the Federal Ministry of Education and Research of Germany, technological sovereignty describes the claim and the ability to shape key technologies internationally on an equal footing.[194] It is this argument that lets us understand that technological development has become a key issue for foreign policy and that policy makers understand how much the development of technology and political power is connected and seen as a political task. The frame of technology sovereignity in this sense is a narration that leads to an understanding that technology development is as much as administration of technological infrastructure a political task to secure and develop political interest in a global community. Technological sovereignty remains a basic prerequisite not only for military and economic strength, but also influences the stability of democracies in competition with autocratic states and other competitors.

> "The geopolitical requirements of open societies to preserve their sovereignty internally and externally have changed significantly with digitalization. Internal and external sovereignty can now be threatened without a declaration of war by cyberattacks on parts, the entire functional infrastructure or individual state institutions of a country (e.g. by wiretapping), without it being clear who the attacker is." [195]

For the concept of Technopolitics, it is important to keep ethics in mind to be able to contour a tendential shift. To this end, the distinction made by Hans Kelsen between normative sovereignty and descriptive sovereignty is an important demarcation, as Hans Köchler aptly notes in light of the preoccupation with digital sovereignty. The [196]sovereignty of the citizen online is consistently elaborated, especially in the anthology

[194] Technologische Souveränität - BMBF Digitale Zukunft (bildung-forschung.digital) Last Access 23.03.2022.

[195] 2020. Haric, Peter, Grüblbauer, Johanna: Geopolitical Challenges of Digital Sovereignty in the Neo-Imperial Age and the Importance of Quality Media. In: Friedrichsen, M., Bisa, P. (Ed.): Digital Sovereignty - Trust in the Network Society. Wiesbaden. Springer VS. P.168-170: P. 170.

[196] 2016. Köchler, H.: Souveränität, Recht und Demokratie versus Machtpolitik. In: Friedrichsen, M., Bisa, P. (Ed.): Digitale Souveränität - Vertrauen in der Netzwerkgesellschaft. Wiesbaden. Springer VS. P.93-112.

by Friedrichsen and Bisa, and is always linked to a notion of normative sovereignty. Of course, it is not possible to simply collide the notion of sovereignty with technical buzzwords such as 'cloud computing', but the related discussion, as Jäger does in the anthology in question, is perhaps stylistic for this approach to the notion of sovereignty under the condition of digitalization. To simply let the decentralized individual data storage run through the various end devices of the citizen, as Jäger has in mind, however, and who proclaims this approach to individual data storage, as an expression of civic sovereignty, seems difficult in view of today's development, as one can already see in the discussed point of the control points. [197]At the same time, data security and the right to be forgotten will always remain an issue of civic digital sovereignty. An important technical building block of digital sovereignty is cryptography[198], but data storage and data protection are also central aspects for this discussion.

4.8. Digital Authoritarianism

According to Lindsay, the Chinese concept of sovereignty is based on a notion of space that links the digital sphere to national notions, insisting that 'undesirable' influence on a country's 'information space' should be prohibited. China's notion of cyber sovereignty is the strict link to nations alone, which is intended to largely undo the early stages of the Internet by transferring all organisations entrusted with Internet governance, which are mostly composed of participants with technical or economic backgrounds and civil society, to governmental organisations such as the UN, where nation states negotiate rules among themselves and representatives of civil society no longer have any decision-making power and thus no say in the architecture of the network.[199]

[197]2016. Jäger, W: Neue Rolle öffentlicher Rechenzentren für Bürger-Datenschutz und Bürgerbefähigung. In: Friedrichsen, M., Bisa, P. (Ed.): Digitale Souveränität - Vertrauen in der Netzwerkgesellschaft. Wiesbaden. Springer VS. P.23-35.

[198]2019. Weis, Rüdiger: Technische Sicherung der Digitalen Souveränität. In: Friedrichsen, M. Bisa, P. (Ed.): Digital Sovereignty - Trust in the Network Society. Wiesbaden. Springer VS. P.53-66.

[199] 2015. Lindsay, J.R.: The Impact of China on Cybersecurity, Fiction and Friction. http://belfercenter.ksg.harvard.edu/files/ IS3903_pp007-047.pdf Pp. 37-38

> "The internet sovereignty versus multistakeholder debate involves not only technical standards and protocols but also alternative visions of global political order, one based on authoritarian states and the other on liberal globalization."[200]

The approach of China to re-install the nation-state as the main body of rule-making processes has led to criticism.[201] At the same time, China is open to digital technology and more than 850 million Persons use "sophisticated devices to access a rapidly burgeoning digital economy".[202] Its leadership and administration have effectively managed a technological leap that has transformed China into a leading technology nation. China's transformation is accompanied by an ideology-driven technology policy, expressed in the fear of losing control over boundary-pushing technology. Creemers cites the example of the Chinese firewall. For China's administration and leadership, it is important to maintain control over all kinds of processes in the digital world as well as in the real world, using technological devices to exert excessive control over its people.[203] China has brought its specific notion of what cyber sovereignty is to Internet governance negotiations such as the United Nations Group of Governmental Experts (UN GGE), revealing that it has a clear idea of "the role of IT in the relationship between the state, citizens and the economy".[204]

China put forward a narrative as if the United States had the main power in digital affairs and was the real main actor in state regulation, ignoring the fact that internet governance was organised through a multistakeholder model. As Schia and Gjesvik point out, "Fang Binxing, credited as the creator of China's famous Great Firewall", framed the fact that the internet was structured in the US as an issue of state power, which allowed China to pretend that only if internet governance was shared by different nations would

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[200] 2015. Lindsay, J.R.: The Impact of China on Cybersecurity, Fiction and Friction. http://belfercenter.ksg.harvard.edu/files/ IS3903_pp007-047.pdf P.39.

[201] 2016. Amnesty International: Tech Companies Must Reject China's Repressive Internet Rules. https://www.amnesty.org/ en/latest/news/2015/12/tech-companies-must-reject-chinarepressive-internet-rules/

[202] 2020. Creemers, Rogier: China's Conception of Cyber Sovereignty Rhetoric and Realization. In: Broeders, Dennis, van den Berg, Bibi (Ed.): Governing Cyberspace Behavior, Power, and Diplomacy. Rowman and Littlefield, Lanham, Boulder, New York, London. P.107.

[203] Op.Cit. 2020. Creemers, Rogier: P.110.

[204] Op.Cit. 2020. Creemers, Rogier: P.108.

it confront US hegemony and lead to democratisation. The multi-stakeholder approach was then branded as illegitimate, while an intergovernmental approach was presented as the cure.[205] China's government and administration have used this argument to get a foot in the door without abandoning an authoritarian style of governance. Xi Jinping has consistently followed this narrative, putting pressure on organisations organised around the multi-stakeholder model:

> "We should respect the right of individual countries to independently choose their own path of cyber development, model of cyber regulation and Internet public policies, and participate in international cyberspace governance on an equal footing. No country should pursue cyber hegemony, interfere in other countries' internal affairs or engage in, connive at or support cyber activities that undermine other countries' national security."[206]

Cremer identifies three principles under challenge. He understands it a) as a claim against the universalist claim of online openness and applicability of universal rights, b) as a grip of a national government to receive the authority to rule over all non-state actors and stop private initiative by countering a multi-stakeholder governance model, c) as a form to establish a state ruled internet governance in a multilateral context directed against the like-minded states.[207] However, China is not only using its digital technology to gain an opportunity to develop the digital world more according to its own vision via leverage points such as the distribution of technology for digital public services or the determination of the architecture of digital products and services. Technology is also used by the state to control its citizens. These processes are subsumed under the

[205] Nagelhus Schia , Niels, Gjesvik, Lars: China's cyber sovereignty. Norvegian Institute of International Affairs Policy Brief 02/2017. https://nupi.brage.unit.no/nupi-xmlui/bitstream/handle/11250/2434904/NUPI_Policy_Brief_2_17_Schia_Gjesvik.pdf?sequence=4&isAllowed=y

[206] Remarks by Xi Jinping at the opening ceremony of the Second World Internet Conference http://en.chinadiplomacy.org.cn/2021-01/27/content_77158782.shtml

[207] Op.Cit. 2020. Creemers, Rogier: P.115.

umbrella term of 'digital authoritarianism'.[208] In this case, digital sovereignty might is the modus operandi of technopolitics.

Perhaps the concept of digital sovereignty is a backdoor to political agency in the digital sphere: on the one hand, digital sovereignty is based on the establishment of technological independence; on the other, it refers to the high-tech landscape that processes globalisation and can be linked to the equal design of technology and technology architecture, as well as cyber governance processes. Creemers explains how China is critical of a digital economy and cyberspace governance guided by conflicting values such as freedom, liberalism and universal rights. In terms of Internet policy, he offers a counter-design based on Westphalian peace, which treats cyberspace as if it were nothing more than a space of sovereignty.[209]

4.9. Multistakeholder Governance

Redeker, Gill and Gasser[210] base their exploration on digital constitutionalism processes in this multi-stakeholder organized internet governance on the concept of societal constitutionalism developed by Gunther Teubner[211]. According to this concept, Redeker et al explain, the process of institutionalisation of norms in multi-stakeholder communities is threefold: the first step is the definition and agreement over a set of norms by a specific group, in the second phase this set of norms becomes law and in the third phase this law receives a constitutional character by reflection processes. They identify a full range of actors and are able to estimate the activities of the different actors, that have proposed some kind of norms agreement and developed digital

[208] 2019. Hart, Melanie, Johnson, Blaire: Mapping China's Global Governance Ambitions - Democracies Still Have Leverage to Shape Beijing's Reform Agenda. https://www.americanprogress.org/article/mapping-chinas-global-governance-ambitions/ Last Access 20.03.2022.

[209] "Over the past decade, however, China has become increasingly vocal and active in defending a different approach, one based on "cyber sovereignty" (wangluo zhuquan)" 2020. Creemers, Rogier: China's Conception of Cyber Sovereignty Rhetoric and Realization. In: Broeders, Dennis, van den Berg, Bibi (Ed.): Governing Cyberspace Behavior, Power, and Diplomacy. Rowman and Littlefield, Lanham, Boulder, New York, London. P.108.

[210]2018. Redeker, Dennis, Gill, Lex, Gasser, Urs: Towards digital constitutionalism? Mapping attempts to craft an Internet Bill of Rights. The International Communication Gazette 2018, Vol. 80(4) 302–319.

[211] For a further debate on the concept see: Teubner, Gunther, Golia, Angelo: Societal Constitutionalism - Background, Theory, Debates. Max Planck Institute for Comparative Public Law & International Law (MPIL) Research Paper No. 2021-08. Final version: ICL Journal, vol. 15, no. 4, 2021, pp. 357-411.

constitutionalism, naming civil society organizations and coalitions of state actors or public international institutions as the most active actors.[212] Redeker et al identify some phases in which topics and claims have a general direction, arguing that in the late 1990ies the declarations were mainly engaged with the intersection of digital technology and human rights. By the late 2000s the multi-stakeholder community deals with corporative suppliers and its power relation to citizens that are mainly identified as users. Those claims, Redeker et al argue, find its way into legislation with declarations of state actors dealing with rights to be applied to its citizens.

Westerwinter and Reinsberg[213] present a quantitative analysis of multi stakeholder partnerships in international relations in general and find a majority of the actors to be either official from the like-minded states or nascent from the like-minded states so that in sheer numbers, the "west" dominates the multi stakeholder community. The domination of the western states, as PRC points out with its argumentation for a digital sovereign design of digital governance, is not found in the concept of a multi-stakeholder community, but in the de facto network and its representatives' connections.

The European Union has set a clear path for legal development in the digital age and a clear vision of civic sovereignty in the digital society and knowledge economy. A small, selective review of adopted policies may briefly reveal the European strategy for the development of civic digital sovereignty, all of which can be understood as an attempt to set ethical framework conditions for the digital society and its knowledge-based market. First and foremost, the EU Charter of Fundamental Rights states that EU citizens have the right to the protection of their personal data. The European Data Strategy was intended to create a single market for data, but the notion of citizen sovereignty online in particular played a major role here. In April 2016, agreement was reached on the General Data Protection Regulation (GDPR) [214]. The law, which came into

[212] 2018. Redeker, D., Gill, L., Gasser, U: P. 312.

[213] Westerwinter, Oliver, Reinsberger, Bernhard: The global governance of international development: Documenting the rise of multi-stakeholder partnerships and identifying underlying theoretical explanations.. Rev Int Organ 16, 59–94 (2021).

[214]2020. Daigle, Brian, Khan, Manaz: The EU General Data Protection Regulation -An Analysis of Enforcement Trends by EU Data Protection Authorities. Journal of International Commerce and Economics, June 2020.

force on 25 May 2018, regulates the companies and individuals who process data. [215]In December 2020, the EU Commission presented a proposal on a law on digital services, which will regulate platforms in particular. There have also been developments in the AI field, with the White Paper on Artificial Intelligence presented in 2018 and the European Commission presenting a draft legal framework for AI in April 2021, which includes a risk tiering for AI applications - the civic sovereignty tied in the EU's value system is the basis for European political action to regulate data-based economy. Especially for the regulation of AI (basis is the DGSVO), which needs very large and high-quality data, the idea of "trustworthy AI" is at stake and the EU rejects, for example, social scoring applications as practiced in China. [216]

In addition to the question of how a digital technology, such as AI in this case, is to be linked to values, there is the question of sovereign powers over the development houses of digital technology. For this purpose, the European Commission, similar to the USA, has developed a regulation on foreign investments, the Regulation (EU) 2019/452.[217] The security of digital national infrastructures by regulation of foreign investments is a rather classical instrument that is used in a new digital setting. The EU pursues a strategy of regulation based on values.[218] Civic sovereignty has a lot to do with the notion of security, because security here is linked to a notion of the individual per se, linked to a centuries-old civil rights development going back to Rousseau and others, and does not mean the authoritarian notion of security of a political system, as China

https://www.usitc.gov/publications/332/journals/jice_gdpr_enforcement.pdf#:~:text=The%20%20European%20Union%20%28EU%29%20%20General%20Data,%28DPAs%29%20have%20issued%20over%20%24500%20million%20in%20fines.

[215] Daigle and Khan have elaborated that the DGSVO is particularly an instrument used in *Western* Europe.

[216]https://www.brookings.edu/blog/techtank/2021/04/26/the-eu-path-towards-regulation-on-artificial-intelligence/#:~:text=The%20European%20Commission%20has%20identified%20examples%20of%20unacceptable,AI%20system%20similar%20to%20China%E2%80%99s%20social%20credit%20scoring.

[217] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019R0452&from=EN#d1e823-1-1

[218]2021. Jelinke, Thorsten: Mapping Europe's Digital Sovereignty Strategy: The EU-China-US Triangle. March 2021. Available at: https://www.researchgate.net/publication/350493056_Mapping_Europe%27s_Digital_Sovereignty_Strategy_The_EU-China-US_Triangle#fullTextFileContent

exemplifies.[219] The idea to interpret digital sovereignty as civic sovereignty means to defend the liberal idea of a free people entering the digital world with a notion of security. At the same time, economic activity (for example, because of the European difficulty in obtaining high-quality mass data for the creation of AI) is thus restricted, and civic sovereignty is not so much interpreted as market activity, as is the case in the US.[220] Digital sovereignty merely melted onto civic sovereignty in the European Union. This could be an indication that digital sovereignty cannot simply be seen as a modus operandi of technopolitics, but that qualitative differences in policy histories can be made here. Besides the development of classical regulation like Data-protection, the European Commission has set out to develop a new approach to digital regulation that uses a definition of dangers towards digital technology development, before a development process materializes. This is the case with the proposed AI-law, where developers can use a scheme to classify development according to a characterisation of dangers.[221]

The organization of digital sovereignty in the U.S. is a case that also spans time, as different aspects have been regulated by policies at different times. Executive Order 11858 (Foreign Investment in the United States), for example, which established a committee to oversee investments by foreign investors, is certainly worthy of mention when it comes to digital infrastructure and the security of US national interest.[222] This classical idea of sovereignty is accompanied by digital sovereignty, like we have seen in EU. Looking at new developments in digital products and the U.S. response to them, Floridi defines:

> "The fight for digital sovereignty is an epochal struggle not only of all against all, but also of anyone allied with anyone, with variable alliances changing

[219] Op.Cit. Köchler, H.: Pp. 93-112.

[220] See on the European valuation of values: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_de#digitale-brgerschaft-rechte-und-grundstze-fr-europerinnen.

[221] Regulatory framework proposal on artificial intelligence | Shaping Europe's digital future (europa.eu)

[222] https://www.presidency.ucsb.edu/documents/executive-order-11858-foreign-investment-the-united-states Last Access 10.04.2022.

according to interests and opportunities. The most visible clash is between companies and states, and it is asymmetric."[223]

An interesting case is the attempt to regulate cryptocurrency that President Biden has directed based on his Executive Order (Executive Order 14067 of March 9, 2022).[224] A global currency by definition is to be replaced by a national global currency and the USA is to become the leading nation for the cryptocurrency sector as well. Nevertheless, the USA was mainly influenced by a history in which Internet activists completely abandoned statehood and declared cyberspace to be a space that was sovereign in its own right, leading to an overall rejection of state regulation and in this path, forming a multistakeholder model for internet governance as the main modus operandi of digital rule.[225]

And in exactly this direction goes the argument of Andrea Leiter, who states that "cyber sovereignty does not necessarily have to mean governance by a state" and who argues based on works by Lawrence Lessig and Primavera De Filippi[226] that codes and agreements in the digital become not only a new code of conduct are some kind of law. The USA have collected data massively and developed enormous data repositories, as the scandal around Edward Snowden has revealed half a decade ago. Yet the transmission, the flow of data, has largely not been exposed to American policies that tend to develop the internet as a digital sovereign US American room, and did not treat the internet as "American soil". Unlike the PRC, the U.S. has vocalised its goal not to entangle the Internet but to work to ensure that it is an open, interoperable, secure, and reliable information and communications infrastructure.[227]

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[223] 2020. Floridi, Luciano: The Fight for Digital Sovereignty: What It Is, and Why It Matters, Especially for the EU. Philosophy & Technology 33. Pp.369–378. Pp: 371.

[224] See as well: President Biden Signs Quantum Computing Cybersecurity Preparedness Act (thequantuminsider.com)

[225] https://sustainabilitydigitalage.org/2020/01/21/are-these-the-20-top-multi-stakeholder-processes-in-2020-to-advance-a-digital-ecosystem-for-the-planet/ Last Access 12.04.2022.

[226] 2020. Leiter, Andrea: Cyber Sovereignty: A Snapshot from a Field in Motion. Harvard International Law Journal Vol. 61, 04/2020. https://harvardilj.org/2020/04/cyber-sovereignty-a-snapshot-from-a-field-in-motion/#_ftn1

[227] https://www.state.gov/policy-issues/cyber-issues/

4.10. Geoeconomics and policies – why technopolitics and national sovereignty don't fit for investment

While geoeconomics understands that geopolitical events affect the economy in terms of inflation, risk premia, cash flows and financial assets, we understand technopolitics as a form of geoeconomics where the distribution of technology affects politics. We see this as a reverse process. International economic cooperation sets pathways that affect policy in the form of a hidden geopolitical event, and the installation of technological infrastructure is its main example. Domestic policies on technology affect economic growth, but they also affect domestic policies abroad. Protective measures that are subsumed under increasing technology sovereignty and, at the same time, indirect unfriendly interference and the acquisition of power through politically targeted sales and market development are the signs of a technology-based economy that finds itself in systemic competition. This can lead to a collapse of world trade. However, it seems that countries with the most developed techno-ecologies have a competitive and geopolitical advantage, as access to know-how and research becomes a power base. Intensive cooperation tends to be the basis for development, so that politically driven sales strategies for political power plays do not simply affect market valuations. Shared socio-economic pathways are crucial for social and economic development. On the one hand, the agency of technology has an impact on regulation; on the other hand, strategic dependence, which is characterised by the path dependency created by technology, has also become an important area for regulation. In this way, geo-economics and law are intertwined. The economic, political and social costs of a technology can no longer be considered in isolation. We regard technopolitics therefore as a considerable obstacle for the development of technology and its dissemination. Opportunities and risks demand for an international policy responding to hazardous consequences for investors (be they private or government). Technology transition needs a form of open policy that fills technological gaps for those that demand it, while not dominating volatile and marginal economies. If this direction is not corrected, demand will decline, new transmission and distribution of infrastructure will slow down and the

interconnection of technopolitics and technology investment will grow stronger with the price of eroding law, and legal development, while bringing decimation of the sales markets with it.

The fact that there is a technopolitics that is clearly working towards a position of political power in the sense of world leadership, and is also being communicated in this way, as the example of China shows, not only jeopardises economic interests and the development of a cross-border market, which (despite legitimate criticism here and there) has undeniably been an advantage for human development so far, but also undermines our understanding of the markets for technology. While having one's own market and infrastructure is an important rationale for digital sovereignty, it is important to frame the concept of digital sovereignty in such a way that neither the capital market nor, in particular, the technology market suffers negative consequences. This can only mean, on the one hand, that information is provided about technopolitics as power politics and that one's own (especially critical) infrastructures are examined for their potential risks by purchasing products from all those countries that use technopolitics to achieve political world domination (especially interactive and transactive machines). On the other hand, the entrepreneurial freedom not to be used as a political arm of Washington or Brussels should be more strongly communicated as an advantage of the Western market model.

By definition, open markets are characterised by the unrestricted movement of goods, services and capital across borders, driven by the principles of supply and demand. While these markets are often celebrated as engines of economic growth and innovation, they also raise pressing ethical concerns. To address the challenges of technopolitics, we need to consider strategies for the development and use of technology. Several ethical frameworks have emerged, including ethics in design, digital diplomacy and market-generated ethics.

Ethics in design, for example, seeks to integrate ethical considerations into the design process of technological products and services to ensure that they do not harm users or society. This framework emphasises the importance of thinking about the social

and environmental impacts of technology, as well as the ethical implications of technological decisions. Meanwhile, digital diplomacy aims to promote ethical practices in the digital sphere, particularly with regard to cybersecurity, data protection and digital rights. This approach recognises the importance of fostering trust and cooperation among states, as well as between states and non-state actors, to ensure the security and stability of the digital ecosystem. Lastly, market-generated ethics refers to the ethical values and norms that emerge from market interactions, guided by the principles of competition and consumer choice. This framework recognises the value of empowering consumers to make ethical choices and promoting transparency and accountability in business practices. To address the challenges of technopolitics, we need a multidisciplinary approach that integrates ethical considerations into the design and use of technology.

By integrating ethical considerations into the design and implementation of technological products and services, and by promoting ethical practices in the digital domain, we can ensure that the benefits of technology are distributed fairly and sustainably. A technologically advanced, Western-oriented market could have many positive effects, including fostering innovation, economic growth and human development. By fostering a culture of innovation and entrepreneurship, such a market could drive technological progress, resulting in new products and services that benefit consumers and society as a whole. In addition, a Western-oriented market could encourage the adoption of ethical practices and values, such as transparency, accountability and respect for human rights, which could lead to a more equitable and sustainable global order.

It is crucial to recognise that technological imperialism is a multifaceted problem that cannot be solved by a single approach. It requires a comprehensive response that includes policy changes, economic incentives and international cooperation. Moreover, while promoting domestic technology development can be a positive step towards mitigating technological imperialism, it can also exacerbate existing inequalities and create new technological divides, leaving developing countries and marginalised communities behind if they lack the resources and expertise to develop their own

technology or access foreign technology. A Western-oriented technology market that prioritises digital sovereignty could potentially help mitigate the effects of technological imperialism by reducing reliance on foreign technology and enhancing domestic capabilities. By encouraging the development and use of domestic technology, countries can reduce their dependence on foreign technology providers and exert greater control over their technological infrastructure. However, a Western-oriented technology market can also have negative consequences. It could lead to fragmentation of the global technology market, with countries and regions developing their own technology ecosystems and standards, leading to higher costs and inefficiencies for businesses and consumers. In addition, a Western-led technology market could exacerbate geopolitical tensions and conflicts as countries seek to protect their digital sovereignty and advance their technological interests, leading to an increase in protectionist measures such as tariffs and trade barriers that could harm global economic growth and development. Therefore, a Western-oriented technology market that prioritises digital sovereignty must also consider the ethical implications of its actions and strive to create a more equitable and inclusive technology ecosystem. This includes promoting international cooperation and technology transfer to help bridge the technology divide and ensure that all countries have access to the benefits of technology.

5. Summary

Technopolitics is becoming an important analytical term in political science, and we have attempted here to contextualise and substantiate the concept. The analytical power of the concept has already been hinted at in this first attempt, although much work remains to be done to make the concept analytically sharper. First, it should be noted that the concept of technopolitics developed by Mayer et al. (2014) will enrich work in the field of international relations. At the same time, it can already be said that there is a possibility of feedback with this term to administrative science and international relations. This will be a matter for further work. Political scientists can use the concept of technopolitics to better understand the intersection of technology and

politics in the international arena. It will allow them to analyse the acquisition of political power through the use or development of digital technologies and environments, and the emergence of new control points in digital space that cannot be defined by national borders. This can provide insight into how technology is being used to gain power and influence, and how it is shaping the political landscape in the international arena. It can also be used to examine the role of national innovation systems in the knowledge economy, and how investment in technological development and innovation can affect power struggles in the international arena.

The term refers to new levels in both horizontal and vertical regulatory horizons, describing new logics of power acquisition in which new regulatory spaces, new spheres of power, and new ideational political ideals tailored to technology emerge and need to be studied to better understand political action in international space. Technopolitics is the acquisition of political power across and beyond geographical spaces. A new form of political geography is emerging that cannot be defined by national borders, but by new control points in a digital space, or by the use or development of a digital environment, such as software or techniques to monitor a space. Technopolitics is thus no longer just a concept of public administration or international relations, but a development of political geography. New logics, new spaces of power and design can be described with it and its inherent qualities. These conceptual qualities also suggest that we are dealing with an extension of the compendium of political concepts, and with a basic political concept that can only be experienced through digitalisation.[228] But this form of political geography is not simply 'political'; as in the field of classical political theory, the term transcends its own boundaries and is also important for the further development of economics and for the classification of investments in digital space. Any form of investment could be a potentially space-altering investment and have its own implications, the nature of which must first be examined. This means that the sale and deployment of digital technology has an impact on an international system, the

[228] Which brings us to Renate Mayntz concept of infrastructure and its meaning for political power that she already noted in 1993 in her work on great technical systems.

consequences of which must be the subject of further research. This is oversimplified in our model. It suggests that the strategic sale of products has a path-dependent layer that has a major impact on the different actors in the international sphere. Exactly what this looks like is also an open question that needs further investigation. Our article, which is designed for qualitative work, also gives us hints for possible quantitative research concepts. For example, the new spaces of power can certainly be studied well with network analyses. What does a national innovation system really look like, how is transport now organised, how is digital space ordered and by whom, and where does the development of a digital product empower or set new boundaries? - These questions can mark out a striking space for which the concept of technopolitics can be used as an analytical model within technology-oriented research in the international realm.

In retrospect, we have seen how countries have strategically used their research investments to accumulate power, and how countries have developed a new strategy to resist the accumulation of power in the spaces that these countries consider 'theirs'. Technopolitics, then, already has a counterpart that can also be understood as a spatial strategy: digital sovereignty. Here, too, sovereignty no longer refers to a fixed national border, but is linked to the distribution of digital products, which in sum can be understood as the establishment of a new form of border. This refers to the fact that one's own capacities for the production of checkpoint products are built up or maintained. However, this approach and this new form of strategic use of digital products can only be understood in the light of the development of new science systems that have emerged from the gradual development of national innovation systems. These national innovation systems, which have also made an important contribution to the knowledge society and its knowledge economy, are the backbone of the new geopolitics in the digital space. This new layer of international relations is becoming increasingly important as the impact of information and communication technology (ICT) grows. In this sense, the concept of technopolitics could help to analyse the technological level of international conflict. Technological imports and the large-scale use of technology can be analysed on the basis of this concept. The term is suitable as a conceptual framework for a phenomenon that is also becoming increasingly important internationally:

technology and its use. The evaluation of the use of technology, the international background of a power play for the distribution of technological goods is mapped with the term. In the context of international security, technopolitics refers to the ways in which technology and digital environments can be used to gain or maintain political power on a global scale. This can manifest itself in a number of ways, such as countries investing in research and development to produce advanced technologies that give them a strategic advantage over other nations, or countries using digital surveillance or other technologies to monitor and control the actions of other states or non-state actors. The concept of technopolitics also highlights the importance of digital sovereignty, which refers to a country's ability to control and regulate its own digital environment. This can include things like protecting citizens' privacy, maintaining control over critical infrastructure, and ensuring that the country has the ability to produce its own digital technologies rather than relying on foreign companies. In terms of international security, technopolitics suggests that the strategic use of technology and the digital environment can have a significant impact on the global balance of power. Countries that are able to develop and control advanced technologies may be able to exert greater influence on the international stage, while countries that are unable to do so may find themselves at a disadvantage. Moreover, the emergence of new control points in digital space means that traditional notions of national borders and sovereignty may no longer be adequate for understanding and managing global security issues.

As technology-driven changes such as the platform economy or social networks and the success of the data economy have led to changes in everyday behaviour and created new forms of agency in smart technology, the regulatory implications of new technologies have become increasingly important. The relationship between technology and politics is a circular one, where political decisions can influence technological developments and vice versa. The significance of technical developments for political action and the political favouring of technical developments have become increasingly important as technology-based radical innovations in intelligent machines transform society. The knowledge economy, based on investment in technological development and investment in research and innovation, has become an important precondition for

power struggles in the international arena. The formation of national innovation systems has become an important backbone for the knowledge economy that has developed alongside digitalisation. Technological development has become an increasingly important driver of economic prosperity and political power, especially in the age of globalisation and digitalisation. Technopolitics represents a new quality in the relationship between politics and technology in the international arena, as it is a style of politics that uses the new framework conditions of digitalisation to gain power and whose strategic political coordination is found in the implementation of material projects in the field of technology. The power interventions of politics take place in an international context and are influenced by the development and diffusion of technology.