Würzburg Centre for Social and Legal Implications of Artificial Intelligence

Research Paper No. 1

Social Implications of Artificial Intelligence – A Research Programme on Digital Transformation

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[Cite as: David Roth-Isigkeit, ‘‘Social Implications of Artificial Intelligence – A Research Programme on Digital Transformations‘‘, *SOCAI Research Paper No.1* (2019), available at socai.de]

Social Implications of Artificial Intelligence – A Research Programme on Digital Transformation

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Key words- digital transformation, artificial intelligence, information technology, social change, technological development

I. INTRODUCTION

Successfully managing society's digital transformation is posing a monumental political challenge for present decade and decades to come. The extent of this social change is often underestimated in public debate. It is already evident that the increasing interaction with information technologies and the dependency that arises from this interaction is shifting social lines of conflict and thus paving the way for a rapid social transformation.

Social transformation also suggests that social cohesion, currently institutionalised in the nation state order, will be challenged. As the current crisis of democracy demonstrates, changes in the distribution of wealth and employment have an effect on political processes. The traditional social order of the nation state is increasingly under pressure by the centrifugal forces of our global digitalised world. Developments such as the Internet and artificial intelligence are making the traditional social construct of the nation state seem at best outdated. In a worst case scenario, however, the transformation towards a new social order will occur in its absence.

Who is best positioned to uphold the principles of law and social equality, if not the community of mature democratic nation states? In case a political and social response to social transformation remains absent, such would permanently affect the conditions of societal coexistence. Europe will face wealth distribution conflicts and systematic political changes in a different and far more complex way than the one we got accustomed to during the relatively stable past period of 70 years of democracy.

The Würzburg SOCAI - Centre for Social Implications of Artificial Intelligence has set itself the task to address these challenges from an academic perspective. In this regard the dynamics of that transformation will be thoroughly described, in order to follow up and present political proposals. This research programme provides an outline of the subject matter (II), the methodology (III), the agenda (IV) and the research fields (V) that will be pursued within its framework.

II. SUBJECT MATTER

The SOCAI Centre's subject of research is digital transformation, in particular the dynamics of its development and the possibility for regulatory interventions.

a. Digital Transformation

Digital transformation processes as such function primarily not as an extraordinary but rather as a normalised state within society. Society is in a constant state of flux, with technology taking a determining role. If we try to grasp and label certain transformations, we look for overarching paradigms which represent this change. If we speak, for example, of globalisation as a transformation process in world society, we identify the increasing integration through worldwide trade and the associated decrease of political importance of nation states and their borders. This reduction to a specific paradigm allows for a simplification of the description of change in a complex system such as society.

In this context, by speaking of a *digital* transformation we attempt to describe and isolate the influence that the capacity expansion of information technologies has on processes of social change. However, a description of the historical development isolating technological factors remains incomplete. The industrial revolution in the second half of the 18th and over the course of the 19th century was not triggered in isolation from the development of the mechanical loom and the steam engine, but was rather integrated into a complex macroclimate of societal preconditions such as the ideological erosion of the agrarian economic production (Braudel 1986, 630). At the same time, the success of digital companies takes root in the social inequality and international politics weakened by great power thinking. The in-between of political and economic frames that becomes apparent in the absence of a unified frame of taxation and redistribution offers the more flexible private actors unprecedented chances of wealth accumulation.

This incorporation into the general climate of world society should not distract from the fact that technological development is a decisive factor in the current transformation. Information technologies, i.e. the ability to transfer, store and process data, change essential elements of our social coexistence in various areas. A crucial factor is that the development of machine intelligence, the collection and use of *big data* and global networking serve as basic technologies, which much like the steam engine can be used almost universally by adapting to various social subtasks. In this universality of development of a new technological platform and its explosive adaptation to new possibilities of use, and hence also possibilities of added value, lies the depth of the social change that is currently being observed.

In its focus on artificial intelligence, the social discussion is misguided by the unfortunate concept formation. The advances in the area of machine learning cannot necessarily be considered 'intelligent', thus with an independent problem-solving capacity. They rely on the combination of large volumes of data with high computing power. By constantly regrouping the underlying data, methods of machine learning are capable of recognising *small patterns* otherwise incomprehensible to the human observer. Using this analysis technique, for example, a radiologically generated image can be read out by algorithms more precisely and completely under certain conditions.

The boom in artificial intelligence can be explained, among other things, by the fact that both raw data collection and the computing capacity required for analysis have experienced exponential growth in recent years. The interaction of these factors also creates important synergy effects. Through global networking and in particular the widespread connection of the world's population to the Internet, significant volumes of raw data on human behaviour can now be collected, which has created its own concept. *Big data* refers to amounts of data which can no longer be meaningfully analysed and systemised by manual work but can only be processed automatically.

The computing capacity required for algorithmic processing is provided, among other things, by an exponentially increasing computer power. The decisive factor here is not that the computing speed of integrated circuits doubles every one to two years according to Moore's law (Moore 1965) which has been empirically confirmed for about 60 years, but rather that the real transformative effect goes hand in hand with the associated falling prices for the general availability of computing capacity[i]. The performance that was built into super computers for millions of dollars a few years ago can now be found in simple smartphones.

The associated changes possess a transformative and for the nation state eroding profundity as they cover the entire breadth of global society, across territorial borders. Access to the Internet, and thus also to large computing capacity via *cloud computing*, is possible almost everywhere via the global spread of mobile Internet. In 2019, for the first time, more than 4 billion people, i.e. more than half the world's population, used the Internet[ii]. In terms of social impact, a successful connection of people to the stream of digitalisation seems even more important than the development of advanced artificial intelligence. Only the widespread use of technology enables a change in social life to the depth described here.

In the service sector, as one of the most digitalised economic areas, we witness a process that might be described with the Polanyian term of a profound global *commodification* (Polanyi 2001, 71ff.). For example, the crowdfunding marketplace MTurk (Mechanical Turk) launched by Amazon is a platform on which individuals worldwide can perform certain standardised tasks *(microtasks)* such as data verification or classification for very small amounts of money[iii].

Digital transformation, in the sense of the approach proposed here, describes the type of social change that is triggered by the increasing interaction of human life with information technologies. This development triggers a *transformative* and not just a modifying effect on society, due to the fact that such changes the defining lines of conflict in society through its depth of penetration. The individual, whose integrity was protected by involvement in participatory systems and the guarantee of privacy, turns from a political actor into a mere user of the digital infrastructure. What in the traditional nation state order were previously conflicts over natural resources are now conflicts over data. Classic warfare is being replaced by cyber war. Territorial sovereignty becomes conflict over bandwidth and infrastructure. It is by no means said that nation states are still the most powerful players in these conflicts, but rather it is those with the best access and information in the global data network that prevail.

b. Technological Transformation as an Acceleration Process

The transformation of the traditional order is taking place at a faster rate than one can deduce from mere observation. A crucial feature of social change determined by technology is that it contains an inherent acceleration of movement. This acceleration is responsible for the centrifugal forces that act on the current regulatory structures and could lead to their erosion. If, as stated above, digitalisation and globalisation are the drivers of social change, then the acceleration of social change can be extrapolated from the exponential development of technical progress.

Crucial for rapid growth is the function that Ray Kurzweil referred to as the *law of accelerating returns* (Kurzweil 2001). Technological development forms the basis for enabling further technological development. In the field of the development of computational processing speed, this hypothesis is reflected in Moore's law mentioned earlier. The associated exponential growth in the computing capacity of processors forms the foundation of the digital transformation. Essential to Moore's law are the falling marginal costs for computing power. Statistically speaking, the number of arithmetic operations to be performed for one dollar has increased tenfold over a period of four years. The decreasing costs in particular have contributed to the general availability of technology. Simultaneously with the availability of computing speed, the number of network participants and thus the potentially available network connections grow exponentially. As the Oxford philosopher Floridi diagnoses, the standardisation of the information medium also means that frictions in the communication between agents of the network disappear: "digits communicate effortlessly with digits" (Floridi 2014, 42). Network effects also contribute to the depth of digital change.

If we accept this hypothesis of the augmenting influence of technology, it becomes clear that, from a macro perspective, processes of social change will accelerate. If we look back at the early history of *Homo sapiens* and compare it with the last 2000 years of human development, this exponential development becomes particularly clear with a thought experiment. If we were able to travel 500 years back with a time machine, we would find it very difficult to get around in the world in which we ended up, which was shaped in 1519 by the Spanish occupation of Mexico by Cortés and the Portuguese Magellan's departure to circumnavigate the world. If a person who was born a few centuries BCE travelled a further 500 years back in time, the experience of the world would marginally change but the essential living conditions of agricultural society would have mostly remained unchanged during this period.

Innovation plays a crucial role in the development of progress. Upon closer inspection, however, this does not run linearly but rather on the basis of key innovations that allow technological leaps (so-called technology nodes in the semiconductor industry)[iv]. It is thus often diagnosed that the time of the traditional transistor processor is up. The speed of Moore's law can no longer be maintained as such since speed improvements are now largely achieved by parallelisation, that is, processors with multiple cores. Even the development of computer technology requires basic innovation, which is to be achieved with progress, for example in the field of quantum computers[v]. This basic innovation can then provide technological leaps that are necessary for the transformation process.

At the end of 2019, Google introduced the 72-bit quantum computer called Bristlecone, a first functional model that is so superior to conventional computers in performing certain tasks in such a way that *quantum supremacy* in application development was seen to have been achieved[vi]. Conversely, this basic innovation will again result in unpredictable leaps in development in terms of cost and the application of the technology. The decisive factor in this development is whether the basic technology can be used for social integration. Particularly due to the technical complexity of the quantum computer, it remains to be seen when this level of development will be reached.

c. Dynamics, Transnationalisation und Uncontrollability: Reasons for the Loss of Social Control

For a large number of reasons, the acceleration of technical development goes hand in hand with the loss of social control. Effective legislation first of all requires that the regulated object and its technology can be described with sufficient accuracy. Due to the speed of technological advancement, an isolated functional description seems hardly possible. Metaphorically speaking, this means that while in the previous regulation it was possible to shoot at static targets, we are now dealing with moving objects of regulation, which are much more difficult to hit.

This is due in particular to the merging of short and long term development processes. If we talk about the development of autonomous vehicles, the increasing automation in the labour market or the use of intelligent algorithms in medical technology, the moment the legislator addresses the ethical and legal guidelines for use, the wheel of technical progress has meanwhile moved on. If we debate the use of primitive communication robots in nursing by which dementia patients could be helped to maintain their intellectual abilities through constant communication, and the legislature lays down guidelines for example on the possible content of the discussions and the usability of the data obtained, it can be assumed that technical development would overtake this regulatory process. In other words,

whenever the law comes into effect, there would already be new technological advances for the functioning of these robots (i.e. the possibility of physical interaction) which in turn would raise new ethical and legal questions.

This makes a socio-democratic regulation of technology on the basis of planning and forward-looking action impossible. The ethical and legal decisions must be removed from the sluggish democratic process and handed to expert committees instead. Control by tech-savvy expert groups is, however, precisely the accompaniment of technical advancement which is not poised to ask the crucial question: which developments do we want as a society and which do we reject as potentially dehumanising?

Especially with regards to the fact that the exponentially growing technical progress has no logical target, this question cannot be ignored. We must get used to the idea that anything is potentially possible and feasible. In this world of unlimited possibilities, the race for more and more technical accompaniment of human existence has to give way to a development with sound judgement that keeps the basics of humanity in view (Nida-Rümelin, Weidenfeld 2018).

A second aspect threatening the loss of social controllability is the difficulty in holding actors responsible. Global technological issues have become transnational issues (Roth-Isigkeit 2018). On the one hand, these are characterised by the fact that they cannot be standardised within sovereign nation states due to the nature of the matter. National lawmakers are not the appropriate legislators for the formulation of standards for the law of the Internet. For technological developments that are linked to physical objects, national government legislation can still be maintained albeit with some difficulties such as standards for autonomous vehicles. However if we leave the realm of developments that have no physical relationship with the end customer and can be operated via servers from anywhere in the world, the national legislature becomes toothless.

Transnational issues are, however, characterised by the fact that private companies are becoming norm entrepreneurs. On the one hand, the commitment to self-set standards by multinational corporations sounds like progress. However, it must be taken into account here that there is a democratic problem lurking behind voluntary self-legislation. Private companies, which are the main drivers of technical innovation, can flexibly shape both the framework for technical development and determine the tax burden by choosing the legal system they want to face. This deliberate choice of the most advantageous jurisdiction is called *forum shopping* (Bell 2003).

Democratic communities are thus denied access to the prosperity gains and the control of technical developments. This is particularly problematic as democratic processes themselves are threatened by technical advances, for example by the automated influence social networks have on election outcomes. Here too, it is important to take into account changed power and conflict constellations.

This fluidity of transnational technology which increasingly escapes the traditional framework which is generally characterised by inertia and national borders, threatens to completely slip away from democratic communities. The possibility of free panel selection threatens the so-called regulatory *race to the bottom*, at the end of which there is a complete withdrawal of democratic access. A central question must therefore be to find ways to strengthen the role of the community in order not to let democracy become impaired in the face of increasing private regulatory power. In 1995 Niklas Luhmann prophetically characterised the support for this nation state order as a historical anomaly (Luhmann 1995, 586). The dominant role of technology in society threatens to erode this popular support.

A final aspect of the lack of regulatory access to democratic communities is the largely unexplained risks of research and development in artificial intelligence. These are related to the inherent uncontrollability of the technology, which is reflected on the micro level by the so-called *black box* problem, on the application level by the development of autonomous and no longer controllable weapon systems and, finally, also from the perspective of the uncertain prospects of a possible general artificial intelligence that would exceed the level of human intelligence (Bostrom 2014). In the long run, such risks would have to be passed on from democratic communities, at least internally, to those who benefit from the development.

III. Methodology

The methodological challenge for the scientific and political support of digital transformation is first and foremost to correctly interpret the framework conditions of the dynamic and internal acceleration of the technological change. The second step is to translate these into practical instructions in order for social actors to become not only reactive but also proactive.

a. The Time Factor: Necessity for a Procedural Approach

From a methodological point of view, the temporal perspective is the most important perspective for the legal support of digital transformation. Traditional democratic legislative processes take at least a few months from defining the conceptual content and objectives to drafting of laws and parliamentary adoption. If we tried to deal with the regulatory problems in this classic way, the regulatory objectives would not only be overlooked, but legal uncertainty would also be brought about with regards to the actual

complexity of the questions. On the question of how we should react socially to advances in the field of autonomous driving or in medical technology, the legal treatment stipulated in the legislation would again become obsolete with the advancement of technical developments. This process would intensify with the increasing pace of developments.

In order to reverse this balance of power and to enable society to act at least to a limited extent proactively, we have to endeavour a projection into the reality of future and medium term technical developments. It is crucial to think about the effects of legislation before the final introduction of technology. Proactive action thus requires a reversal of the traditional relationship between society and law and would shift the time of constituting regulatory models to the moment of technical development, even in the event that these opportunities are not being realised in practice.

What is required is a scenario for certain paths of technical development by means of a socio-technical way of thinking. How does the development of the quantum computer affect technological advances that can be perceived in society? This depends on detailed questions of technical components, such as their costs, their practical usability and uptake. Which obstacles have to be overcome on the way to universal adoption? How likely are the different paths of development? What effects will a certain technology have on social processes (in the field of quantum computers, for example, the need to improve encryption technology)? Which forms of legislation would need to be presented in these different scenarios? Answering these questions requires an interdisciplinary approach with perspectives both from technology and society.

b. Clarification and Consolidation of Disciplinary Perspectives of Natural and Social Sciences

In order to realise the vision of a technical processing and space of possibilities, the forming of an interdisciplinary social thought is essential. Traditionally, in particular in the German scientific community, an almost practically standard scientific organisation has been prevalent in various disciplinary perspectives.

Although knowledge formation in academic disciplines has the advantage that their linguistic unity enables them to sufficiently immerse themselves in specific technical questions, they ultimately fail to translate their findings into a general social discourse. There is therefore a lack of a suitable scientific language which would bring natural and social science discourses together. Such translates into an isolation of the legal-social perspective from its technical feasibility, which has a devastating effect on the actual usability and realism of the literature. The discourse is either devoted to the distant utopian future, the occurrence of which in the form specifically described would seem highly improbable. Alternatively, at the time of publication, it would run the risk of running behind the wheel of progress which by then would have turned even further.

If we ask ourselves, whether and which rights intelligent machines should have, for example, this of course cannot be isolated from the variance of possible technical developments. From a legal perspective, these fundamental questions can only be dealt with dogmatically in a second step. Primarily, both in terms of the technical components and of the legal infrastructure with its regulatory framework, a comprehensive fundamental understanding which does not distract attention from central social questions would be required. One of the objectives of the SOCAI Centre is therefore to provide a framework for an in-depth cooperation between social and technical sciences which has so far rarely been created.

c. Legislation of Technology

The goal of connecting technical development and social science is to regain the upper hand over technology in the context of democratic processes. This political ability to act *(agency)* is a necessary precondition for finding an effective community response to technology that is not limited to plugging the largest holes on a slowly sinking ship. The perception of the possibility of a more active role of the public in responding to technological developments is therefore not only a political necessity, but also a democratic obligation.

The government and its administration must be able to regain political capacity to act against transnationally diffusing private authorities. In the last 20 years, we have seen how public influence in global legislative processes has continued to wane[vii]. Prosperity gains have not been evenly distributed, as private actors have been successful in using the spaces and forums beyond democratic statehood to ultimately play them off against one another. This is where transnational companies have to be made responsible. In an increasingly denationalised world, this responsibility is not just a matter of beneficence, but rather a political and legal obligation.

Translated to legal analysis, this means drawing attention from a static hierarchical analysis of the legal system to a dynamic interaction with social processes. If we see the law as a static, society-shaping superstructure, it will not be possible to catch and cushion the impact of technical change. Dogmatically, this dynamic approach translates into interpreting constitutional frameworks as *living instruments*. Interpreted in this way, they would show structural openness to fundamental change and on the other hand strongly advocate for the preservation of the communication-based conception of democratic politics.

What is therefore required is a new political wisdom that can restore the balance of forces between public and private power. This form of political tactics and techniques, which is attributed to the teachings of Niccoló Machiavelli and Thomas Hobbes, recognises that system-transcending actions may be necessary to adapt the systemic configuration of world society to the new forms of political action. There appears to be little scope for political models beyond nation state decision making without challenging current power and distribution patterns.

IV. Agenda

The considerations regarding the programme on digital transformation and scientific methodology are reflected in three main topics, which form the research agenda of the SOCAI Centre. We advocate a proactive technology policy that sets itself the task of indicating the direction for society at an early stage. We want to ensure that decisions about technological progress, and its development, are linked to democratic processes. Finally, we stand for a decidedly global approach that would overcome any restrictions stemming from nation states, in order to find solutions to digital questions.

a. Towards a Proactive Technology Policy

We are committed to using technology with foresight. Other examples of late regulatory intervention, such as climate change or the controlling of the spread of nuclear weapons, show that the acceleration dynamics of certain technical developments reach points at which they could no longer be controlled by legislation. In the absence of legislation, similar risks are to be expected from digital transformation, particularly from the widespread use of artificial intelligence methods.

The questions associated with the use of digital technologies in society are explicitly political. The current discussion about the ‘ethics’ of artificial intelligence distracts from this question. If we talk about the ethics of artificial intelligence, we are looking for general principles that apply to the use of technology. These general principles are by no means natural constants, but rather political questions as such. What defines a successful human life in the process of digitalisation is a lead question of contemporary political thought.

The implementation of social integration on the other hand is a legal question dealing with a redefinition of constitutional thought. How do our historical ideas fit together with new social situations? How can we adapt the constitutional framework without endangering the foundations of the democratic social order? Proactive politics in this sense require an increase in regulatory speed and reactivity in order to overcome the inertia of democratic legal process. Political communities should be aware of the scope they have at their disposal. At the same time, this form of design also gives rise to a responsibility not to leave the development of society to technocracy. We can and we must open the dialogue about what kind of society we want to live in.

b. Democatisation of Technological Advancements

The key term for the regaining of social control is the democratisation of technical progress. Such profound changes, such as those associated with digital transformation, require democratic control and decision making.

The decoupling of social will formation from technological self-determination, or ‘digital sovereignty’, also harbours the danger that the switchgear of the internal organisation will henceforth remain closed to social knowledge. Luciano Floridi compares this danger with the idea of a *piano nobile* in the Renaissance Italy, which had once been supposed to be the social centre of a house, but was in fact only used for representation purposes, while the actual functioning of the mechanisms in the servant’s ‘machine room’ remained hidden from the user (Floridi 2014, 37). In the same way, the services we take on from privately developed algorithmic control may relieve us of tasks and simplify our everyday lives, precisely by releasing us of our understanding of how they work. In both cases, the resulting distorted perception of reality would pose a threat to democratic politics.

Private actors are ready to provide services on tasks that have traditionally been assigned to the public sector. We see this in supposedly insensitive areas, such as the privatisation of municipal service providers, but also in the allocation of network infrastructures or the organisation of cyber security. Here too, we must recognise the superior know-how of the service providers and disregard the loss of public function in individual cases. In a democracy, however, the term ‘citizen’ refers to more than simply a user of an infrastructure.

c. A Global Approach

The crisis of democratic self-determination with regards to new technologies is also due to the excessive demands placed on national politics that is increasingly confronted with a complexity of the global setting beyond their reach. As a result of its global nature, technology policy can only be thought of nationally *and* globally. A further aspect of the SOCAI Centre's agenda is to work towards the

global recovery of democratic power. The term ‘global’ in this context extends to the spatial assignment of the phenomena as well as to the actors involved (Roth-Isigkeit 2018, 62f.).

Technology cannot be thought of as a real-world phenomenon within national categories. Worldwide networking in particular is largely independent of territorial boundaries. At the same time, sovereignty continues to play a major role, for example through the physical control of nodes and high-speed cables. The result is a hybrid space that partially and in certain aspects transcends territoriality, but in which historical residues of sovereignty continue to have an impact. This also applies to the actors involved. Central regulatory authorities are public while the rules and agendas are set normatively by private actors, for example through corporate ethics or research and development programmes. In order for the democratisation of technical progress to succeed, strategies for dealing with this global piecemeal are required. How can collective self-determination and universal and coherent decision making prevail under circumstances of plurality?

V. RESEARCH FIELDS

In line with this standpoint, the SOCAI Centre and its associated members will essentially be active in three topic areas, which do not conclusively define the work programme of the Centre. Research field 1 explores the implementation of digital transformation in constitutional democracy. Research field 2 expands the perspective of technology law beyond the state. Research field 3 looks at the question of what normative implications the development and operation of machines could potentially have.

Research Field 1: Digital transformation and the democratic constitutional order

Digital transformation is not bound by the limitations of the constitutional state, whereby it in fact fundamentally challenges its institutions. In order to keep in touch with an increasingly digital world, the state should incorporate digitisation and integrate technical change into its governance. This primarily affects administration, in particular specific public tasks. Contrary to private sector companies however, the state's future execution of tasks will be exposed to public feedback on its rule of law as well as its execution of democratic theory. Jurisprudence is faced with the task of finding solutions for the new constellations that do justice to the constitutional framework, and at the same time ensure any required opening to new technologies.

Public administration must comply with constitutional principles. It must be legal, e.g. the need for legitimacy for any exercise of public authority in respect of the principle of democracy. The established construct of personal democratic legitimacy, which is based on the concept of human decisions, changes fundamentally when decisions are made by artificial intelligence. Decision makers are no longer legitimate officials, but autonomous algorithms. In view of the necessary democratic legitimacy of all state action, the question arises whether the use of autonomous algorithms can be democratically legitimised as an authority and thus representing an appropriate organisational tool.

It is also questionable whether the current social reality and citizens’ expectations indicate a duty to use artificial intelligence in public administration as a prerequisite. Technological progress goes hand in hand with increases in efficiency and efficacy, which could also create an obligation to use artificial intelligence -based systems. The use of these systems could imply that citizens have easier access to administrative authorities and faster decision making. Does the use of autonomous algorithms not justify the principle that the state has to serve its citizens and their interests and can hence be considered an obligation under the legitimising effect? This is directly linked to a topic area that deals with the problem of state liability for any wrong decisions made by autonomous algorithms. How do we solve gaps in responsibility if an autonomous algorithm makes an illegal decision that cannot be attributed to a single official? Ultimately it is crucial whether the autonomy risk of digitisation associated with the use of self-learning algorithms would fall within the state’s area of risk.

Research Field 2: Technology law: in and beyond the state

Technology law is a relatively young area of law that deals in particular with the effects of new technologies on law and society. A key question here is how technical progress interacts with and is taken up by the legal system. In some cases, new legislation, for example, will be sufficient to ensure integration into social practices whereas other cases will require a radical revision of traditional terms and ideas. Particularly due to global networking, technology law is an area that is essentially characterised by its supra, trans and international aspects.

The definition of ‘technology’ in this context ranges from digitisation and automation technologies to domains covered by information and communications technology (ICT), automated data processing and artificial intelligence -enabled developments in general. The discipline of ICT, among others, addresses matters related to privacy, data protection, cyber security, telecommunications, Fintech, data-driven economic models and in particular networked technologies.

This list clearly shows the complexity of the legal field as it requires a diverse set of knowledge from regulators. A deeper understanding is required with regards to both the technical components and the legal infrastructure with its regulatory framework.

The relationship between technology and law reproduces a tension that could already be found in the relationship between technology and society. Is technological progress an improvement in living conditions and does it have a stabilising effect on society? Do technologies not lead to an erosion of legal guarantees? Both perspectives are justified in the field of digitalisation and, depending on each individual case, must be weighed up against each other after a concrete risk assessment.

The technological developments that aim to bring about varying degrees of systemic decentralisation in governance could be considered to improve trans-jurisdictional collaboration at first glance. Nevertheless, such would not automatically negate the necessity forp a certain degree of centralised control over registries or data storage within individual jurisdictions, nor does it allow for an abdication of responsibility for maintaining verifiable audit practices in general. In addition, the notion of territoriality, as the primary nexus of jurisdiction, has increasingly become a subject of redefinition given the cross border and distributed nature of networked technologies. In this context, the concept of the nation state as a central foundation of international law has increasingly received pressure.

Furthermore, when supranational laws are taken into account, such as the EU digital single market legal infrastructure, territoriality also plays a crucial role. For instance, the EU General Data Protection Regulation (GDPR) in its scope of application concerning the data of EU residents held by data controllers based outside the EU relies on this notion. Emerging community-based model infrastructures and digital platforms, however, could define an alternative approach to jurisdictional boundaries, whereby physical demarcation would be increasingly replaced by other decisive factors which could be of a particular economic or technical nature. As a result, public policy making and political discourse among stakeholders would inevitably start shifting the focus further away from national jurisdictional boundaries.

Research Field 3: Machine normativity

Technological progress in the internal structure of machines allows them to make increasingly complex decisions and to assess issues. In doing so, they also penetrate an area that was previously withheld from humans: making value judgments. Value judgments differ from classic optimisation tasks, which could be perfected in the area of machine intelligence. When people evaluate issues, we at least assume that they recognise the fundamental meaning of the course of events in the world. However, machines are currently unable to recognise meaningful relationships.

At the same time, there is a strong need to enable machines to make such assessments. An autonomous vehicle will have to deal with a large number of these assessments in a typical day of operation. The often discussed dilemma in the case of unavoidable accidents, which would require weighing up human lives, will probably remain a rarity. If we consider a wild animal that has leaped onto the road, this decision also contains a basic moral assessment that the machine must be able to solve. Not only in autonomous driving, but also when using machines in maintenance or in autonomous weapon systems for example, the ability to evaluate certain facts normatively would be required. Last but not least, the developing field of *Legal Tech* requires the ability to deal with the open structure of legal norms.

Normative decision making by machines raises all kinds of technical questions. How is it possible, at the software programming and hardware levels, for a machine to weigh in a moral and legal assessment on differing options? How can security systems be created that would be able to prevent particularly dangerous errors? How can we ensure that machines make decisions in the interests of mankind and take account of the growing cultural and social values in their decisions? What does it mean for our relationship with machines if they could conclude contracts and allegedly act morally?

Research in this section is devoted to the whole range covering these questions in collaboration with the three disciplines of law, philosophy and computer science. The SOCAI Centre also examines technical aspects of these decisions. How can we make machines that would take decisions based on human values? Which machine learning processes are required for this? What security systems are available to prevent catastrophic failures in individual cases? Which legal, philosophical and social consequences are associated with normative decisions taken by machines? Would this give machines a special status that could be similar to that of animals, ultimately distinguishing them from humans? What are the legal consequences of the fact that contracts could be automatically submitted by machines? With regards to the automation of legal reasoning, we also research questions specifically tailored to law.

VI. CONCLUSION

The Würzburg SOCAI Centre for Social and Legal Implications of Artificial Intelligence has set itself the goal of providing scientific support for the challenge of digital transformation. Only by actively involving the politically engaged public can the digital transformation be shaped into a democratic process from which global society can benefit in its entirety. We are organising a forum for this project and we happily invite you to participate.

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[iv] Used for example in the field of information technology here
[v] For further details Quantum Computing - Progress and Prospects, 2019
[vi] Google AI Quantum
[vii] See Habermas, "Strukturwandel der Öffentlichkeit", 1962