

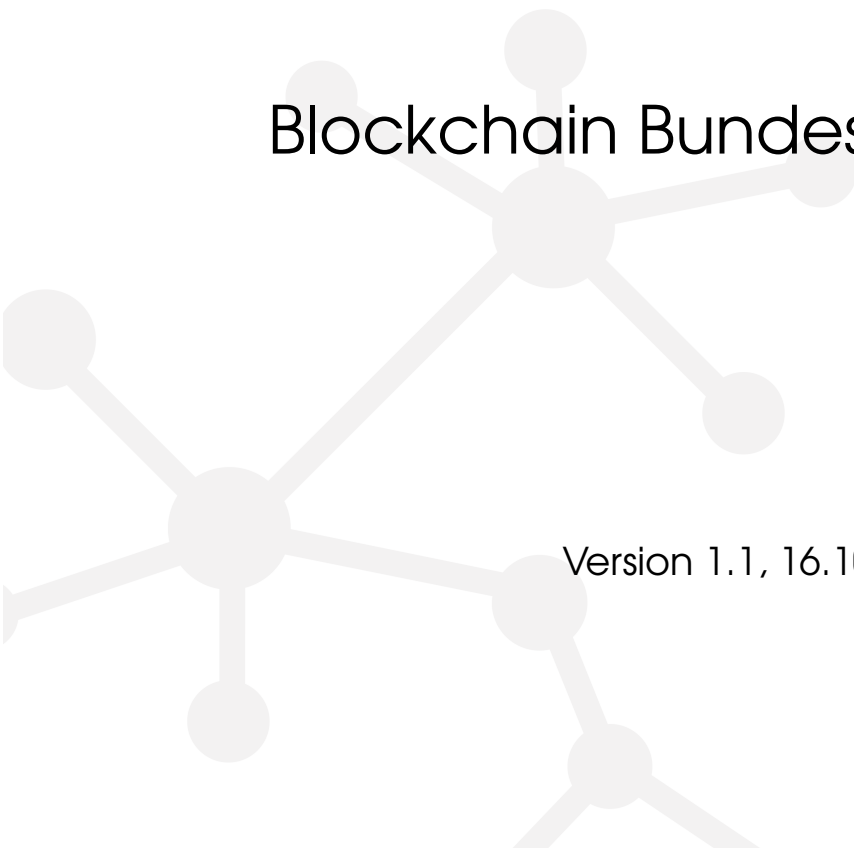


Blockchain

Opportunities and challenges of a new digital
infrastructure for Germany

Blockchain Bundesverband e.V.

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BLOCKCHAIN BUNDESVERBAND

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BLOCKCHAIN BUNDESVERBAND

1. Foreword by the Executive Board

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In a digital economy, almost all transactions consist of database changes. These changes have two fixed points: the database itself and the people who have initiated them. All the proposals in this paper are therefore variations of the following basic theme: on the one hand, the interfaces to the databases must become digital and on the other hand, digital identities must become sufficiently legally secure. Only in a country with digital interfaces to its databases and legally secure digital identities can an Internet of contracts flourish.

The Blockchain Bundesverband is convinced that blockchain and similar decentralized technologies based on cryptography are the basic infrastructural innovations to make a digital economy on democratic structures in Germany a reality. The state has the task of creating the framework conditions for innovative social and business models based on blockchain technology. Above all, it is important to create legally sound electronic identities and interfaces to public databases. The pioneers of the block chain revolution can then fill the space between them with new business models and user-centered services.

The next evolutionary stage of the Internet

Blockchains will be the driving force behind the next evolutionary step of the Internet, the so-called decentralized network or the Internet of contracts and transactions. Blockchain technology uses special protocols based on cryptographic one-way functions to establish trust between unknown subscribers. Block chains enable you to do business with others without intermediaries. Business without intermediaries holds immense economic potential. In addition to the current business models of Web 2.0, it is expected that completely new business models will also be implemented on the blockchain.

What do we mean by Blockchain?

Blockchain has become known as the technology or data structure behind Bitcoin. The term Blockchain has changed. This can best be compared with the term "Internet" and its transformation. Internet was initially the purely information-theoretical term for an "intermediate network" and thus uniform interfaces of computer networks. The term has changed a lot and now refers to a much wider conceptual space that we all know from our daily lives. Similarly, the term "blockchain" has become detached from the description of the mere data structure behind Bitcoin and now describes a group of phenomena that leads to the developments described above. It should be noted that the term "blockchain" is still subject to strong fluctuations. By illuminating various aspects of "blockchain", we contribute to the conceptualization of the term:

- Until now, control over a computer service has always been linked to the control of the hardware on which this service runs, block chain technology resolves this connection
- By using blockchain, a computer service becomes obvious and comprehensible (proofability)
- Blockchain enables a new understanding of computer security: Until now, computer services had to be shielded behind firewalls and secure connections (VPN). Blockchain enables strong cryptographic methods to make protocols and databases so secure that they can run themselves in the internet public without the possibility of unwanted manipulations ("hacks").
- The identity-generating element is administered in blockchain via the private key in a wallet (browser) or in a chip (Internet of Things) by the participants themselves. This leads to an autonomy of the participants.

The rise of the token economy

In addition, the block chain enables the simple securitization of assets and rights into so-called tokens. The rights that such a token securitizes can be very different. If they are limited to rights in rem (ownership) of the digital object and if no further rights are granted, the tokens correspond to the cryptographic currencies (analogous to Bitcoin). If the token holder is entitled to dividend, voting and liquidation rights upon acquisition, these are equity investments (similar to shares). If the company is a partnership and the issued tokens grant profit, voting and liquidation rights to it, the token purchaser becomes a co-entrepreneur. Some tokens grant the owner a right to participate in the online ecosystem ("Access" and "Reward Token") to be established or embody a right to use material goods. The versatility of tokens opens up completely new business models (the oft-cited *token economy*).

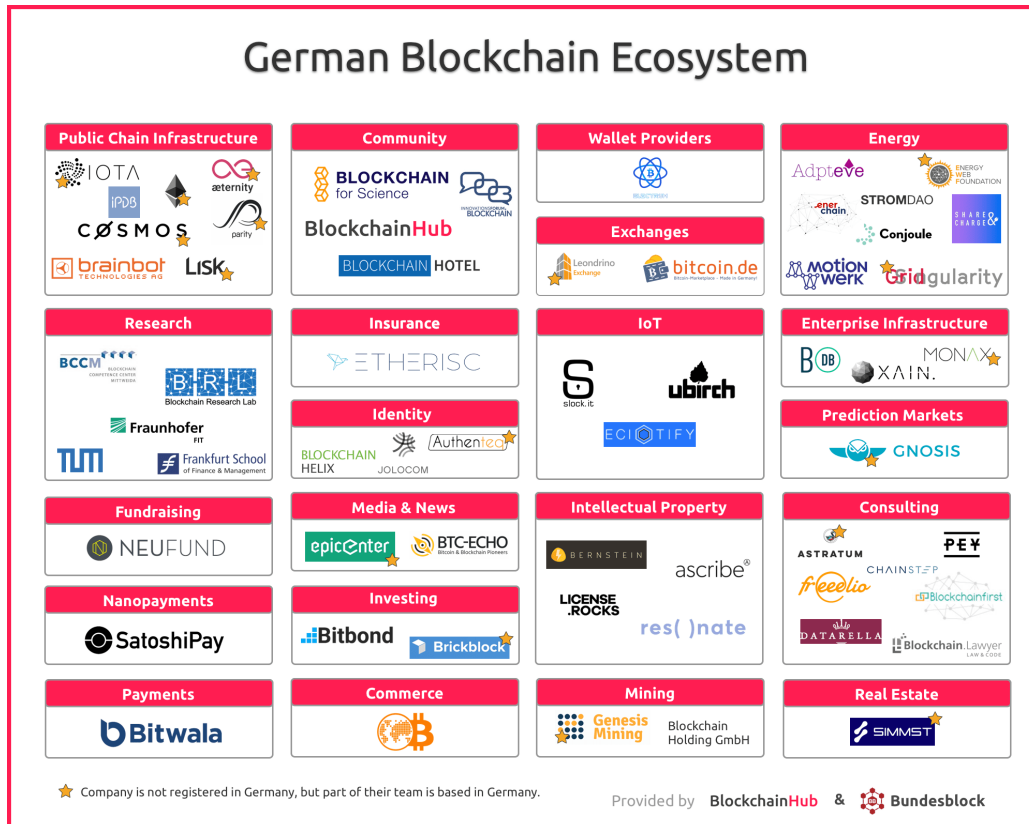
Utilizing industrial policy opportunities

Germany has missed the Web 2.0 revolution, so the global players do not come from Germany. The Blockchain revolution now offers the possibility of a second chance. This insight is fundamental to the significance of Germany in a digitally networked world. The potential of blockchain technology can only develop if citizens, as well as private and public institutions, network with the technology and the technology itself is recognised by law and society.

There is currently an active blockchain ecosystem with immense opportunities in Germany, see also the chart below. Policymakers can use targeted measures to send out signals that decisively increase Germany's international attractiveness as a location for innovation. We hope that Germany will take the lead within Europe for this project. If this does not happen, the actors will continue

to relocate their operations to those countries that have already positioned themselves strategically, such as Switzerland, Gibraltar, Singapore and most recently the Isle of Man.

Germany is the world leader in administration and privacy protection, is a driving force in standardization and has created a genuine export hit with the BGB. In an Internet of contracts and transactions we are therefore in a comfortable starting situation. This opportunity must now be seized with courage.





BLOCKCHAIN BUNDESVERBAND

2. Corporate Law

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Recommendations

The consistent implementation of blockchain-based business models requires major adjustments to German corporate law:

1. Opening of legal forms with limited liability for completely decentralised forms of organisation.
2. Possibility to digitize shares in limited liability companies (here mainly AGs and GmbHs) in the form of tokens.
3. Providing a legally secure framework for issuing and trading digitally created shares of certain legal forms.

Reasoning

The creation of an appropriate legal framework that enables the parties involved to implement blockchain-based business models with limited liability is an essential prerequisite for the permanent establishment of such companies in Germany. In addition to the simple establishment of appropriate business forms, a legally secure framework for issuing and trading digitally created shares is essential for certain legal forms, as the liquidity created by this is often the cornerstone of blockchain-based business models.

Measures proposed

1. In order to implement the recommendations, an interdisciplinary expert commission should be set up to deal with the requirements profile and possible implementation variants of

decentralised legal forms with limited liability. This Commission should submit proposals within six months.

2. The legislator must decide to what extent limited liability legal forms (e. g. in the form of a private company, public company and a non-profit society) are to be made available for certain decentralised forms of organisation.
3. Irrespective of this, the issuance of fully digital business shares must be possible within the framework of existing legal forms. For this purpose, existing legal obstacles, e. g. the requirement of securitization of membership in accordance with the German Stock Corporation Act must be removed. Finally, the existing legal capital market conditions must be reviewed to determine whether and to what extent the issuance and trading of digitally created shares is possible.



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3. Education

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Recommendations

In order to exploit the potential of Blockchain, it is a prerequisite that citizens become familiar with the technology. The Blockchain demands federal association:

1. The new federal government is to support measures to ensure that blockchain is perceived as the basic technology for named applications. For example, it can make a significant contribution in this respect by supporting the development of a neutral programme "Introduction to Blockchain", which is suitable for grammar schools, universities and vocational training. In the course of expanding digital education in earlier school levels, the training of blockchain should also be started gradually earlier.
2. A corresponding training programme is to enable the development of necessary skills for the handling of block chain technology in official structures. We recommend working with leading universities of administration to ensure that the Blockchain competence development training programme is also used in government agencies.
3. The state policy is to influence the curricula at universities, vocational schools and schools in order to take into account and be prepared for future economic realities that are influenced by blockchains in the long term.

Reasoning

The state educational policy prepares its citizens for society. Educational concepts can impart the functions and advantages of future-oriented technologies such as blockchain and make a significant contribution to the development of the state, economy and society.

By clearly acknowledging the relevance of Blockchain for the development of the state, economy and society, the new federal government can set an important signal to promote the "Blockchain trust technology". Accompanying measures such as a federal-funded training programme and confidence-building pilot projects are important foundations for growth and efficiency through blockchain.

Successful pilot projects in other countries show what potential lies in the use of blockchain by the public sector itself. Therefore, it is important to gradually build up know-how in administration.

Contents at state level

The Blockchain Federal Association demands the development and establishment of teaching concepts for schools with the following objectives:

1. The basics of blockchain technology are taught in the subjects of computer science and economics.
2. In addition, students and programmes should be encouraged to gain a basic understanding of the advantages of decentralisation and trustless systems through their own experience (hackathons, etc.).

We recommend the development and establishment of a course "Introduction to Blockchain Technology" for use at universities with the possibility of using the material in a restricted form also at secondary schools, vocational and official advanced training. Essential components of a course "Introduction to the Blockchain technology" include:

1. Creation of three lessons:
 - (a) Introduction to Blockchain technology from a technical point of view
 - (b) Applications from different areas: What are possible blockchain-based ecosystems?
 - (c) The potential and expected consequences of blockchain technology for society, business models and economic systems
2. Use of these teaching units as modules within the framework of a standard lecture (e. g. on "Big Data" or "Distributed Systems") at the university.
3. Within the framework of these teaching units, references to special disciplines such as cryptography, design of distributed systems or domain specific languages are to be provided, preferably in the form of a literature list for further interested parties, thus facilitating autonomous learning.
4. Communication of the interrelationships between digital identity, block chain and data protection
5. The teaching elements will be offered under the Creative Commons license so that course elements can be freely shared.
6. A strong practical relevance, for example the inclusion of standard hardware such as a Raspberry Pis to learn about blockchain-based IoT solutions.

We estimate the creation costs of such a teaching concept to be approx. 100,000 €.



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4. Energy

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Recommendations

The increasingly clean, but highly fluctuating generation of energy, e. g. through solar roof systems on single-family and multi-tenant buildings, requires a coordinated integration of the decentralized electricity generated into the power grid. The power grid will be modernized and digitalized. Blockchain technology can help to map the associated information flows safely and cost-efficiently, thus helping to ensure security of supply and grid stability in times of the energy transition. We therefore recommend:

1. Blockchain technology shall be used to reliably and efficiently map both supply and demand for electricity and small-scale electricity trading. The functionality of smartcontract-based, automated flexibility and electricity trading is to be demonstrated in a pilot, preferably in the environment of the energy spot market.
2. Blockchain-based alternative implementations of contract management, data provisioning procedures and other standard processes in the electricity industry shall be permitted by defining the relevant regulations in a technology-neutral manner. The functionality of smart contract-based automated processes for supplying customers with electricity can be demonstrated in a

pilot project in cooperation with the German Federal Network Agency.

Reasoning

This step will make it easier to reconcile market liberalisation with grid stability and security of supply. The efficiency and security of supply of the energy market will be increased by creating a common, consistent, immutable information base in near real time.

Blockchain technologies enable authenticated, secure and verifiable communication and transactions between assets, devices, and market participants. On this basis, it is technically possible to fully automate billing systems, contract management and other highly standardized energy market processes. Blockchain enables the data sovereignty of the end user like no other technology before it.

Innovative business and financing models as well as complex incentive mechanisms of the energy industry are massively simplified and thus will be more common through so-called "tokenization." Clean electricity certificates and transparent certificate trading can be realised cost-effectively and reliably via a blockchain-based infrastructure. Additional economic incentive models, both for decentralized renewable energy and energy efficiency, can be created with token-based mechanisms, which reach beyond state-funded subsidies. Data preparation and data exchange across organizational boundaries can also be incentivized by tokenization. This offers new business opportunities, especially for startups, small and medium-sized enterprises, and possible bases for new research and development.

The regional value creation potential, which is enhanced in particular by decentralized energy generation, is then effectively realized in the regions. A decentralized infrastructure that supports both energy and informational transactions in the settlement processes will increase the profitability of these decentralized investments. Power grid design and operation becomes more cost-effective due to the availability of real-time information. The regional direct marketing of micro-investments or peer-to-peer trading within network areas and municipalities will become economical. As market mechanisms are embedded in blockchain-based protocols, the grid and market can be better reconciled in a liberalized energy system.

Measures

1. Market rules for trading small quantities of electricity need to be revised or clarified, such that the barriers to blockchain-based micro-transactions can increase liquidity in the electricity market and thus the profitability of flexibility (such as storage).
2. Legal/regulatory requirements must be formulated in a technology-neutral manner, especially in the case of specifications for data acquisition and provision, such that blockchain-based alternatives can be offered. Technology-neutral specifications to ensure the correct energy data basis would allow the following alternatives:
 - (a) Traditional calibration and random sampling of analogue electricity meters, as well as plausibility checks and corrections by automated data analysis procedures and the audit of the results via the blockchain.
 - (b) Instead of legal requirements for supplying electricity according to a standard load profile, a needs-oriented supply by suppliers and electricity-producing end users by means of energy data accessible via the blockchain.

The availability of data measured in real time and modern data analysis methods dispense with the technical specifications of analytically or synthetically created standard load profiles or the random sampling test for digitalized metering points.

3. In regulated areas, a clear framework must be created such that new technologies, e.g. blockchain-based solutions, can be considered an economically attractive form of implementing digitalization in the energy industry, e. g. through flexibly funded regulatory sandboxing areas and open benchmarking for
 - (a) certificate issuing and trading through a decentralized blockchain-based solution
 - (b) market master data management and asset registries with a decentralized blockchain-based solution
 - (c) algorithmic flexibility trading in the continuous spot market via smart contracts
 - (d) data exchange and standard processes (MaBiS, GPKE) through a decentralized blockchain-based solution
 - (e) usage-dependent network charges through a decentralized blockchain-based solution
4. The regulatory framework must be sufficiently clear where needed to allow for the legally compliant implementation and application of blockchain-based solutions. We see a need for clarification and adaptation, in particular with regard to the requirements for the conclusion and content of digital energy supply contracts as well as the content and design of accounting and billing, the requirements for changing suppliers, the content and scope of reporting obligations imposed on market participants and the determination of network charges - particularly for the small-scale trading of green, regional electricity.



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5. Healthcare System

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Recommendations

Digitization and networking in the health care system is far behind technical possibilities. The effectiveness of health care is thus limited.

1. We recommend to provide a universal, digital infrastructure by means of blockchain and thus enable a networked health care system.
2. Patient data as well as data from other interest groups remain cryptographically secured under the control of patients and precisely defined user groups (doctors treating patients, participating billing centers, referring physicians, ...).

Reasoning

Blockchain infrastructure makes an emancipation of the user possible. This can lead to a technological privilege of the data owner in the health system: only the patient and the authorized data user have access to the data. Furthermore, Blockchain enables the decoupling of service/hardware and data - i. e. the entity offering a service or infrastructure has no control over the data alone. Especially when looking at the reasons that have prevented the creation of a networked healthcare system in the

past, it becomes clear that blockchain can bring a new approach into the complex multi-stakeholder system.

Besides patient data handling, there are more applications of blockchain in healthcare:

1. In health research, blockchain-based methods could open up new possibilities in privacy assurance. Blockchain-secured multiparty-computation may make all health care data available for healthcare research with respecting subject privacy.
2. The blockchain can be used to track critical products in the supply chain (pharmaceuticals, blood substitute products) as well as organ donation and transport.
3. The traceability of services and their billing can be improved by the system-immanent transparency of the blockchain.

Measures proposed

1. We propose to explore and support the use of blockchain for data access control and networking in pilot projects in the healthcare system.
 - (a) The possible effects of data autonomy on patient emancipation will be evaluated. The legal environments for patient data protection will be examined under the new aspects of the blockchain.
 - (b) The aim is to look for points of contact with previous solutions (e. g. health card). This should be done in close cooperation with stakeholders.
2. The possibilities within the framework of health care research are to be evaluated. Blockchain-based solutions for the pseudonymous availability of all health data are to be investigated.
3. The use in other areas of healthcare (e. g. pharmaceutical product tracking, organ donation) is to be evaluated.



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6. Financial Supervision

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Recommendations

The Blockchain Bundesverband acknowledges in principle that certain applications of the Blockchain in the area of financing may be subject to general financial supervision and that compliance with certain requirements (such as the existence of an approved prospectus, for example) is a prerequisite. In detail, however, there are considerable legal uncertainties, which disproportionately delay the implementation of projects in Germany. This applies in particular to functional securities equivalent tokens, whose issuance and trading still raises a large number of questions relating to financial supervisory law. We therefore recommend:

1. A significant increase in capacities within the BaFin so that inquiries can be answered promptly.
2. Enabling digital "securities" in this legislative period.
3. In the forthcoming implementation of the EU Prospectus Ordinance, the option to opt for the prospectus exemption for public securities offers with a total consideration of up to EUR 8,000,000 is to be exercised, while at the same time obliging issuers to prepare an extended information sheet (in accordance with Section 13 of the German Securities Trading Act ("VermAnlG").
4. Clarification of the regulatory framework for decentralized token transfer systems (decentralized exchanges).
5. At the same time, the regulations on swarm financing for certain investments (§ 2a VermAnlG) must be harmonized (increase in the exemption amount of currently EUR 2,500,000, abandon-

ment of the requirement to use Internet service platforms, extension to other instruments such as in particular profit participation rights).

6. The Federal Government should support further research into the issue of crypto euros ("Cash on Ledger").
7. In general, the Federal Government should advocate the harmonization of framework conditions for technology-based financing methods across Europe.

Reasoning

Blockchain technology offers a wide range of applications in the financial sector. These include virtual currencies (in addition to the regional currencies known in Germany and elsewhere for decades), payment services, new forms of securitization, new financing mechanisms (particularly in the trade sector by linking them to IoT data) and the swarm financing of companies and projects (known as "ICO" or "TGE").

The current legal uncertainties have so far led to German companies operating from abroad, guaranteeing fast and targeted access to local financial supervisory authorities. This is particularly the case in Switzerland and Gibraltar, which formally host a large part of the European Blockchain companies. A significant increase in capacities within the BaFin is therefore imperative in order to speed up the opinion-forming process on regulatory issues within the BaFin and to shorten the enquiry periods, which are still far too long. The BaFin currently has individual blockchain specialists, but no dedicated blockchain (or crypto) department. By way of comparison, the SEC's US Supervision department consists of 25 employees with a further 90 on-demand employees. Banks are currently recruiting staff to a not inconsiderable extent on this subject, and at the same time companies' interest in digitized business models is growing, so that a noticeable increase in enquiries can be expected.

The desire to have digital "securities" admitted corresponds to harmonization efforts over many years within the EU (so-called "dematerialization" of securities). So far, these efforts have largely failed due to Germany's resistance. The use of paper documents is no longer necessary to create legal certainty in securities transactions, as the broad range of advocates of dematerialization of securities shows: the first public consultation on the harmonization of securities law (2009) by the EU Commission shows that the United Kingdom, the United States, the Benelux countries, the Nordic countries and the Central European states in particular support the project. In these jurisdictions, a digital issuance of securities is already possible today for the most part. We recommend that the new federal government actively push ahead with the dematerialization of securities.

As part of the implementation of the new EU Prospectus Regulation, national legislators are entitled to a considerable amount of scope for manoeuvre, in particular with regard to the freedom to create prospectuses: The obligation to publish prospectuses is waived throughout the EU for securities offers up to a maximum of EUR 1,000,000 and may also be waived if the total value of the offer does not exceed EUR 8,000,000. In order to avoid competitive disadvantages for Germany as a business location, we recommend that you make full use of the scope available to you and harmonize national regulations on swarm financing outside the securities area (i. e. within the scope of the Asset Investment Act).

Measures proposed

Siehe Empfehlungen.



BLOCKCHAIN BUNDESVERBAND

7. Tax classification

Elfriede Sixt, FinTech Academy

Recommendations

1. The BMF must draw up and publish clear guidelines on the assessment of transactions in digital currency for value added tax and income tax purposes.
2. The timely development of competence in authorities for the legally compliant administration of the guidelines is necessary.
3. In order to realize the possible administrative efficiencies, for example in tax collection, the use of blockchain technology has to be tested on the basis of a pilot project.

Reasoning

The lack of uniform guidelines leads to inconsistent treatment of the same facts by companies and tax offices. The resulting uncertainty makes Germany unattractive for companies in the cryptocurrencies and blockchain technology sector.

Measures proposed

1. Adjustment of valuation rules

Determination that if cryptocurrencies are held as business assets, the corresponding valuation rules of the Income Tax Act are to be applied for accounting entrepreneurs. As is the case with immaterial financial assets, an allocation to fixed or current assets is to be made on the basis of their typical corporate function. The documented intention to retain the assets in the long term will be decisive for their allocation to fixed assets. Otherwise, current assets exist. The tax-determining valuation methods are determined in accordance with the allocation. The current daily value is decisive. The consumption sequence procedure to be used must also be specified here.

2. **Commercial income generation with cryptocurrencies**

Ascertaining that income with cryptographic currencies resulting from independent, sustainable activity (which is undertaken with a view to making a profit and constitutes participation in general economic traffic) is income from business activities.

3. **Cryptocurrencies in private assets: Income tax treatment**

A clear regulation is necessary to determine whether transactions with cryptocurrencies in private assets are to be treated exclusively as private sale transactions or whether and under what conditions there is also the possibility that the income generated with cryptocurrency transactions may fall under § 20 EstG (i. e. like shares). The follow-up procedure to be used is also dependent on this.

4. **Mining / Receiving of Bitcoins/transaction fees**

If cryptocurrencies are created ("mining"), there is basically a commercial activity, which entails corresponding tax consequences. The creation of the cryptocurrency is therefore treated no differently than the production of other assets.

5. **Sales tax**

On the basis of the ECJ case law on the cryptocurrency bitcoin, the following turnover tax statements apply to Bitcoin:

(a) **Exchange of legal tenders for bitcoins and vice versa**

If legal tenders (e. g. euro) are exchanged for bitcoins and vice versa, this is a tax-free activity according to ECJ jurisprudence (see ECJ 22.10.2015, Case C-264/14, Hedqvist; UStR 2000 Rz 759).

(b) **Use of Bitcoins for the payment of deliveries and other services (services)**

Deliveries or other services (services) which are not remunerated in legal means of payment (e. g. Euro) but in cryptocurrencies are to be treated in the same way as other deliveries or other services (services) which are remunerated in legal means of payment. The basis of assessment for such a delivery or other service is determined by the value of Bitcoin.

6. **Earning income with Crypto-Tokens**

A stock of tokens in both business assets and private assets can be used to generate regular income:

A distinction must be made between **passive** income generation through interest-bearing investments. An interest-bearing investment can take place by lending cryptocurrencies to other market participants (private individuals or companies specialising in the trading of cryptocurrencies). If an additional unit of cryptocurrency is promised pro rata temporis as consideration for the cryptocurrency transfer, the question arises as to what these interest rates are to be treated for tax purposes.

However, it is also possible to **actively** generate income through active participation in decentralized platforms, where these tokens are either cash or an access right/means of payment. Depending on the extent of this active participation in the platform, the amount of the additional unit of cryptocurrency transferred to the individual token owner is determined. It shall be determined to what extent such an active income generation is based on income from business activities or, if any, up to what extent income from capital assets or other income is to be assumed.



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8. Digital Identities

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Recommendations

In order to enable the use of blockchain technology, the following prerequisites must be met:

1. Digital signatures, as they are used in connection with common blockchain protocols, as well as the high evidential value of blockchain entries, require legal recognition .
2. The documentation of access to personal data in accordance with the European General Data Protection Regulation (GDPR, Regulation (EU) 2016/679) is to be based on a blockchain register instead of a conventional digital storage facility.
3. The state should take on a leading role as authorising entity to enable citizen-centred sovereign digital identities (identity belongs to the person, not an identity provider).
4. The chances and challenges for the public sector as authorising entity of blockchain-based identities are to be evaluated as part of a pilot project (Federal ID-Chain). It is possible that government processes could be shifted step by step to a blockchain-based infrastructure. Advantages are the reduction of interfaces with increased security and lower administration costs.

Reasoning

In an increasingly digital society, it is necessary to be able to carry out legal transactions and the transfer of values and data in a legally compliant manner in the digital space. Digital identities are a prerequisite for this, which enable the population in the digital environment to act by unambiguously assigning them to a digital environment.

Since no digital identity standard has been able to establish itself so far, the development of a sovereign and self-governing digital identity, in which the citizens themselves are entitled to the sovereignty and management of personal attributes and data, makes a meaningful repositioning in this area possible. A technically mature concept of such an identity, which puts the citizen at the centre of attention, opens up new perspectives in the implementation of legal regulations such as the European GDPR or the eIDAS regulation, and sets a counterpoint to the parallel world of digital identities created by social networks (especially companies such as Google, Amazon, Facebook, Apple). The state can serve as a trustworthy foundation by validating digital identities through newly established authorization offices.



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9. Data Protection

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Recommendations

In order for blockchain technology to reach its full potential, the apparent contradiction between transparency and privacy must be resolved. We therefore recommend:

- 1. Data protection law should recognise certain strong cryptographic algorithms as the basis for secure encryption. Those algorithms should be allowed to be used for the encryption and storage of personal information on a blockchain.**

There are symmetric and asymmetric encryption methods, such as RSA or SHA-256, which are currently considered to be difficult to attack. According to the relative personal reference approach, such encrypted data are anonymous data from the point of view of downstream processing, since they cannot be traced back to the user. Only the user can decrypt the data. The GDPR is to be interpreted in accordance with the principle of relative personal reference, so that personal data encrypted by the user is considered anonymous and thus within the scope of application of European and national data protection law is not opened. While today's secure techniques may be broken in the future by more powerful computers and new mathematical approaches, completely secure methods such as the One Time Pad (OTP) also suffer from systemic problems.

- 2. Privacy by design: User-side encryption of personal data according to the recognized state of technology should become a prerequisite for Blockchains.**

If personal data is stored on a blockchain, it should have been encrypted by the user himself. Data subjects in the sense of data protection law should be informed and encouraged to encrypt

their data in such a way. Service providers who want to comply with data protection laws should offer software with approved encryption techniques. It is the legislator's role to create clarity here, and additionally to provide a clear path on how blockchain technologies can be used in a legally compliant manner by service providers.

3. **Reassessment of the data protection responsibility of participants in a blockchain.**

European and national data protection legislation take a centralised approach as they are built around the body responsible for data processing. The division of labour takes place in the form of directed data processing, in which those responsible commission data processing to other departments, which requires a contractual relationship. This concept is incompatible with data processing based on blockchain technology, since the legal prerequisites in a blockchain ecosystem cannot be implemented: Every service provider or user, as soon as they are considered to be responsible under data protection law, is obliged to conclude a data processing contract with each individual node. In addition, as data processor, nodes are not able to fulfil certain legal obligations, such as the obligation to return or delete data after the contract has been terminated (GDPR § 28 Para. 3g) ; § 11 Para. 2 No. 10 BDSG).

Reasoning

The conflict of objectives between the right to privacy of the individual's data and the right of society to greater transparency and traceability will be a major issue in the coming decades. The consideration of blockchain technology in data protection law will make it possible to implement a large number of business ideas based on blockchain in Germany.



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10. Intellectual property and IT law

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Recommendations

Intellectual property

Despite some reforms, intellectual property law, in particular copyright law, is still deeply rooted in the imaginary world of pre-digital creation and consumption of media content. However, the conflict between law and legal reality can only be resolved by a fundamental acceptance of digital reality. The transparent allocation of rights on a blockchain can help to establish a fair balance between the interests of authors, distributors, and recipients. Our recommendations are as follows:

1. Introduction of a blockchain-supported registry of intellectual property rights. The registration of such rights can, when desired, be carried out fully automatically in the creation process (e.g. when you press the shutter release button of a digital camera or during post-processing). *??? Durch die Publizitätsfunktion des Registers wären Lizenzketten transparent abbildbar, die den Rechtsverkehr belastende Situation, dass der gutgläubige Erwerb urheberrechtlicher Befugnisse mangels entsprechender Publizitätstatbestände nicht möglich ist, würde entschärft, und Rechteinhaber könnten direkter bezahlt werden.* The term of protection for types of work with a low level of creation would be reduced in return.
2. Opening a secondary market for digital goods such as music, books and films. The European Court of Justice ruled in 2012 with the *UsedSoft* judgement that a copyright holder's distribution right for software is exhausted even if the software has been downloaded from the Internet with their consent. This principle should apply to digital distribution of all types of work, not just computer programs. By means of blockchain-based registers, the rights transfer could be traced transparently and securely.

3. The management of collecting societies could be made much more transparent with blockchain technology. To the extent necessary, the legal framework for this should be created.

IT-law

One of the major challenges for the successful adaptation of blockchain technology in IT law is for it to be seen to overcome the regulatory concept of the "central operator" of a digital infrastructure or digital service. In many blockchain-based systems, there is deliberately no such central intermediary (also known as service provider), to which due diligence obligations, liability and regulatory actions can be directed. Furthermore, the legal evidentiary value of data secured on a blockchain has not yet been clarified. Nevertheless, there are already a number of innovative startups in Germany that plan to use blockchain technology for the purpose of irrefutable proof of fact. In view of this, we recommend:

1. **The implementation of the eIDAS regulation in Germany, taking blockchain technology into account**

The eIDAS Ordinance came into force on 1 July 2016 and became directly applicable law in Germany. The regulation was deliberately drafted with an open-minded view of the future. Recital 26 of the eIDAS Regulation states: "Given the pace of technological change, this Regulation should adopt an approach open to innovation". Open questions on which regulatory or legislative clarification should be carried out include:

- (a) Can a blockchain meet the requirements of a trust service according to Art. 3 No. 16 of chapter III of the eIDAS regulation?
- (b) Provide a valid timestamp in the sense of a transaction in a blockchain database. Art. 41 eIDAS?
- (c) The eIDAS regulation imposes certain due diligence obligations and liability risks on trust service providers at all security levels (Art. 13). How can they be transferred to a blockchain protocol?
- (d) According to Art. 14 eIDAS regulation requires trust service providers established outside of EU territory to undergo a special recognition process. How can the non-locationality and lack of a central intermediary of a blockchain network be reconciled with this territorial regulation?
- (e) Is a "private key" (private key), as used for identification and authentication within the framework of common blockchain protocols, a suitable "electronic means of identification" within the meaning of the law. Art. 3 No. 2 eIDAS regulation?
- (f) Is the signature process of transactions and blocks in common blockchain protocols a suitable "process" in the sense of the definition of "electronic identification" in Art. 3 No. 1 eIDAS regulation?
- (g) Are the cryptographic procedures used within the framework of common blockchain protocols defined as an "electronic identification system" of Art. 3 No. 4 eIDAS regulation subsumable?

2. **Certification procedures for blockchain protocols**

In a blockchain environment, a protocol agreed to by all participants replaces the central operator. Therefore, a blockchain-friendly regulation must allow the validation of protocols. This could be the act of conferring a "trust mark" by an authorised authority or even the (authoritative) specification of a block chain protocol.



BLOCKCHAIN BUNDESVERBAND

11. Scientific Research

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Recommendations

Blockchain technology allows the immutable conservation of data (time-stamping) and all post-processing ('data trail'). In the future, we recommend that all digital elements of the research cycle - from study planning, data collection, data processing, text generation, publication, assesemnt and research money distribution - should be implemented in a blockchain system. This will make much larger parts of the research cycle open to scientific self-correction and is a logical continuation of Open Data / Open Science initiatives.

Reasoning

Many parts of the research cycle, in particular study planning, data collection and data post-processing, are currently under the sole control of the conducting researchers. Only the final result (e.g. scientific paper or open data) is published, which is then subject to scientific self-control (incl. peer-review). Subsequent changes of research data and conscious or unconscious ex-post-facto hypothesis formation are very harmful to science. Confidence in research results can be significantly increased if more parts of the research cycle are exposed to scientific peer-correction. This is especially true if there is significant social pressure (e.g. climate data) or major economic interests (e.g. therapeutic approval studies). It should be noted that this does not mean the researcher has to disclose any data or work steps immediately, only an unchangeable data history on a blockchain is documented, which can be published in full, for example, at the end of the study.

Measures proposed

1. The possibilities of blockchain in science are to be explored in pilot projects together with the scientific self-governance (DFG, scientific institutions, etc.). New blockchainified publication, research evaluation, reputation and resource distribution systems will be developed and assessed.
2. For approval studies such as pharmaceutical studies a mandatory, immutable blockchainified data trail should be considered



BLOCKCHAIN BUNDESVERBAND

12. Smart Production / Industry 4.0

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Recommendations

Industry 4.0 as one of the core topics of the digitization agenda and blockchains are methodically closely related, since both trigger cross-system and transaction-based processes. Examples of this are automatic internal and external logistics processes or automatically initiated financial transactions after the execution of defined process steps. Therefore, the implementation of industrial applications can benefit greatly from the properties of blockchain technology.

However, the current legal regime must be checked for applicability and existing laws must be adapted to take into account the special features of blockchain technology such as distributed data storage, immutability of information, impossibility of reverse processing, etc. in the industrial environment. We therefore recommend:

1. Creating a secure legal framework for smart contracts, since industrial mass transactions are hardly economically recoverable in a legal dispute with regard to the applicability of traditional legal norms.
2. Recognition of digital contracts and transactions by smart contracts as a state-of-the-art system with legal references to standards, norms and standard implementations to establish a minimum for qualitative and technical requirements. This includes, for example, the interruptibility of smart contracts in legal disputes, which cannot be interrupted without further measures in the case of smart contracts in the current form.

3. Creation of a legal basis for autonomous IT systems

. This could, for example, consist of the creation of an "electronic person" as a new class of legal entity in order to legally recognise the autonomy of sufficiently complex software code from smart contracts. Other solutions are also possible.

4. Consideration of blockchain technology in the context of data protection.

Reasoning

Industry 4.0 applications are transaction-based, just like blockchain technology. This technological relationship can be used synergistically. Transactions that initiate and control production processes, for example, are processed asynchronously by other process participants. This further processing generates an information gain and thus an economic factor, which can be monetized by cost reduction and profit increase or even by newly founded companies.

However, companies will only enter into highly automated and, eventually, fully autonomous electronically processed contracts (smart contracts) if legal certainty exists, especially for mass transactions. This requires that not only under current law, latent and implicit regulations are "somehow" applicable. This would result in a latently high risk of litigation due to the scope for interpretation, which would cancel out the efficiency gains of electronic mass transactions.

Instead, a clear and explicit legal framework - including the clarification of existing regulations - is required to regulate the execution of electronic contracts. These regulations must also clarify questions of responsibility and liability, which may arise due to technical edge cases such as faulty algorithms, communication delays, misinterpretations of measured values, etc. All the reasonable measures to avoid errors could have been taken in accordance with the state of technology, but not all conditions are foreseeable due to the complexity of the facts, which could result in an execution error with incorrect transactions. In this context, a reasonable use of the technology should be defined, beyond which software defects are no longer attributed to the software developer as gross negligence, limiting their liability.

Since transactions or ledgers of blockchain may also contain personal data, and this data may be stored on any user computer (e. g. notebook, tablet, mobile phone) of blockchain participants, it is possible to hold or operate such data without any active intention, e.g. for business trips outside Europe. The regulations of the European data protection law (GDPR) are too indiscriminate, which consider even the holding of highly encrypted data without further exchange with an unauthorized environment as a violation. These rules hinder and criminalise the active use of blockchain technologies and need to be reviewed, taking into account the accessibility and usability of the data.

Measures proposed

Regulatory compliance mechanisms such as obstruction of contract execution, termination of contract execution, defined response times, and the possibility of tying liability capital to the software etc. are important. technically necessary. Basically, such mechanisms are easy to implement, but may also exclude certain blockchain technologies. Therefore, no consensus will be reached on what measures are needed on a purely technical basis to designate an electronic contract as a "genuinely legally secured smart contract". As long as there is still only limited agreement on the legal side as to how exactly smart contracts can be executed, interrupted, cancelled or claimed and in case of doubt courts have to decide on this, no efficiency gain is to be expected here too - especially for industrial, highly

automated mass applications. Therefore, a clear and explicit legal framework must be set up, which is then technically designed and possibly standardized, in which smart contracts must fit into in order to provide few points of attack for legal disputes in their legal execution.



BLOCKCHAIN BUNDESVERBAND

13. Real estate

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Recommendations

Land registries and building authorities should open up to the innovation of their areas of responsibility for entrepreneurs and start-ups. The authorities involved in real estate transactions, in particular land and building registries, as well as the expert committees should develop interfaces that allow the integration of blockchain-based transactions. These interfaces should be technical in nature, but should also be supported by competent personnel who promote the innovation of public authorities in collaboration with private companies.

Reasoning

Innovations in the real estate sector are made possible by the framework of the political conditions. Digitalisation of the sector can only be effectively pursued if entrepreneurial efforts to improve processes relating to the commercial use of real estate are made possible and supported by the competent authorities. New technologies such as the blockchain in particular enable new concepts and can lead to new food for thought. They have the advantage of greater security and speed compared to conventional eGovernment approaches and can significantly enhance the efforts made so far. Blockchain technologies must be used and promoted in order to exploit potential so that future European and international standards can also be shaped by Germany.

Measures proposed

For this purpose, positions are to be created in the offices for specialised contact persons for blockchain and technological interfaces for the integration of blockchain-based technologies.

1. Through training courses and exchange with the developer community, the knowledge of these contact persons must remain up to date with the latest technical developments.
2. In addition, the development and integration of new digital solutions (so-called sandboxes) is to be facilitated and supported by the provision of selected data. In this way, start-ups are to be given the opportunity to get to know and question existing processes in these 'sandboxes' and to innovate together with the authorities.



BLOCKCHAIN BUNDESVERBAND

14. Norms, standardization and certification

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Recommendations

Germany has to

1. Position itself as a leading nation for norms, standardization and certification for subjects concerning Blockchain technology
2. Become a pioneer for the implementation of norms in the administrative branches
3. Define a legal framework for the integration of Blockchain specific standards for the industry early on
4. Ensure support for provision of recognized certifications for fields such as Digital Identity, data security and Smart Contracts.

Reasoning

There is a joint understanding, that industrialized nations need to specify and standardize domains and aspects of the Blockchain technology such as governance, interoperability, identity, security and use cases on regional and international level. Both Russia and China are currently heavily focussed on creating regional standards and Australia is leading the international work on standardization. On an European level the countries of the EU have decided to create a White Paper under the supervision of the European Committee for Standardization (CEN) to consolidate and formulate an European statement on questions regarding the Blockchain technology.

The German institute for standards (DIN) has already begun to support the international standards technical committee (ISO TC 307). Additionally a member of the German mirror committee chairs the working group for Smart Contracts. It is paramount, that Germany now defends its position by **politically backing** the German Blockchain industry and by formulating a strategic concept that

allows competing with other countries and best enabling Germany to be a leading nation for the Blockchain sphere.

By preparing early for an integration of standards and creating a legal framework for the Blockchain industry, Germany can massively strengthen its competitiveness. The current roadmap of the ISO TC 307 aims at delivering standards for specific areas by April 2020. These areas are: Identity, interoperability, governance, security and data protection and privacy, use cases and Smart Contracts. Both, influencing the standardization process as well as preparing the later integration are important.

Measures proposed

1. Researching what needs and wishes the German Blockchain stakeholders (industry, startups, user) may have and ensuring the German mirror committee of the ISO TC 307 is aware of the results the survey revealed and supporting the recommendations of this report.
2. Setting up a project to analyze Blockchain specific standards and norms as well as challenges through existing or new regulations and laws (GDPR, German data laws (BDSG), financial regulation) to early detect where actions are needed and formulating these.
3. Supporting the Blockchain startup representative for the work on norms and standards.
4. Adding the Blockchain terminology of the DIN (German Standards Association) Connect project BlockOne as basis for the usage of a taxonomy for other sections of this report.



BLOCKCHAIN BUNDESVERBAND

15. Ethical aspects and Governance

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Recommendations

A major element of blockchain technology is the decentralized consensus mechanism. It replaces trusted third parties that otherwise assure the integrity of transactions and prevent the abuse of others.

1. The minimal requirements for sufficient decentralization of a blockchain should be defined.
2. The government/state should take an assuring role in securing blockchain infrastructure.
3. In the mid term open standards for blockchains should be established.

Reasoning

Enabling legal frameworks for blockchain will be much easier to define, if they can assume certain minimal standards to the implementation of the blockchain infrastructure. Among them is the degree of decentralization (diversification of blockchain securing nodes): Real diversification should only be assumed if no concentration of more than 1% of securing nodes to a third party is present (similar to financial portfolio theory). Furthermore, despite the democratic standard procedure of majority deciding making, there have to be certain minimal rights that must not change and that cannot be affected by majority votes (minority protection). Because of our history and experience in the Third Reich minority protection is a particular sensible topic in Germany. Example are the protection of property (tokens are (not yet) defined as property) and other fundamental right such as the right to utter a statement in front of a court. Ideally, such fundamental rights should be incorporated directly into the governance mechanism of the blockchain.

If a system is successful, economic incentive systems typically lead to an increasing concentration of power in the hands of less financially strong participants - an effect that increases over time. Therefore, the incentive mechanism itself must provide for the incentive to decrease or end upon reaching certain concentration thresholds. For the blockchains, which do not currently provide for this, this can also come from outside, such as through legislative discrimination of blockchains with too high concentrations (e. g. in the case of evidence or also in the tax assessment), so that the miners have an interest of their own not to exceed these thresholds, in order not to endanger the success of the blockchain.

Many blockchain projects are working to replace PoW with other consensus mechanisms that are less dependent on economics, and instead use identity or time-based consensus schemes to address this problem. Clear guidelines can facilitate and stimulate the development of these efforts.

Measures proposed

The establishment of a formal sandbox or similar forms of experimental regulation should give room for reflection on new governance and regulatory approaches. Law and regulation change when the facts of the case they regulate change. As a result, legal principles have always been changed and adapted through innovations. In the digital economy, however, such innovations are progressing much faster than they did a few decades ago. This means that the public sector has to deal more quickly with new technologies such as blockchain in order to be able to react to them within an adequate timeframe and help shape them. New methods of governance and regulation can facilitate this difficult task. In particular, regulatory sandboxes have been increasingly used in recent years, including within the European Union. Such a sandbox is a process by which innovators do not have to comply with certain legal regulations for a limited period of time in order to be able to test their product more easily on the market. By working with the authorities, they gain legal certainty and benefit from easier access to investors, which in turn can strengthen the blockchain ecosystem as such. In return, the public sector can manage risk through cooperation with innovators and observe how different legal principles affect a certain facts. The experience gained will then enable us to better define future legal frameworks. Furthermore, such cooperation will also give public authorities the opportunity to learn more about the technology, while making innovators aware of the need and importance of regulation. In addition to such formalised initiatives, it is essential that there should also be more open and flexible forms of dialogue between the blockchain operators and the public authorities. This can have many advantages, such as a better understanding of the technology and its application and significance on the part of the public sector, which thus also has the opportunity to help shape the blockchain ecosystem at an early stage. Sooner or later, regulatory principles will be discussed at the European level and states that have established successful blockchain ecosystems will be discussed. ??? will play a pioneering role here, also with regard to legal principles. Abroad, the public sector is already involved in the development and operation of blockchains in many ways. In Sweden, the land register is being placed on a blockchain, Luxembourg has initiated the Infrachain project, Slovenia is planning a state-run blockchain-think tank, Switzerland is experimenting with digital blockchain identities and Dubai is in the process of transferring its entire administration to the blockchain. Like all other countries, Germany must now ask itself the question as to whether it wants to be an active co-creator of a world in which blockchain will play a central role, or whether it will react passively only later on.



BLOCKCHAIN BUNDESVERBAND

16. Pilot projects

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Recommendations

The digitisation of administration is one of the major challenges of the new legislative period. Especially in the public sector, blockchain technology offers many applications. Their intelligent use can strengthen the transparency and trustworthiness of administrative processes. In particular for **public registers** the technology is of great benefit: the data stored in a block chain are not modifiable and thus forgery-proof. Additionally, the technology reduces the amount of personnel and infrastructure required to maintain such registers. Other internationally discussed applications of blockchain are: **proofs of origin** for products, **auditing and verification** of documents, **digital identity** for citizens and businesses and **electronic elections**.

We therefore recommend to try out **at least one application of blockchain technology in the public sector till 2020** in one or more pilot projects. The Blockchain Association has identified the following cases of application, which are suitable as pilot projects for the public sector.

1. Digital identity for businesses and citizens

In a first step, companies will be able to provide digital proof of identity by means of the blockchain (by linking it to the commercial register). In a second step, citizens should also be able to identify themselves digitally by means of a blockchain certificate (by linking them to their identity card). This will foster a young, growing market in which companies and citizens

can be commercially active by means of blockchain technology. A trustworthy digital identity is also the basis for a successful digital transformation of public administration.

2. **Creation of new registers for more legal certainty in the market**

The human resources and infrastructure costs of operating public registers are drastically reduced thanks to blockchain technology. This makes it possible to create new registers where the publicity of certain information can create greater legal certainty in the market. For example, in the case of the publicity of security interests in movable property such as motor vehicles. In legal reality, the transfer of ownership and retention of title are dominated by security institutions whose existence for legal transactions is not in any way recognisable. In Europe, on the other hand, there is a different trend. The motto is: more publicity through digital registers. Here the block chain can point the way to the future.

3. **Merging of fragmented register systems, e.g. for fugitives**

Today, there is no comprehensive registration system for refugees when they arrive in Europe. This leads to multiple registrations, information that is partially not digitally available, and especially several levels of competence at national and European level operating parallel registration systems (EURODAC; MARIS; AZR; Register of Law Enforcement Authorities, e.g. AFIS). Blockchain technology is ideally suited to serve as a cross-border registry for various national and European authorities. This would make it possible to resolve the questions of responsibility arising from the Dublin III Regulation much faster (assuming a legal basis for bringing together European and national databases). The asylum procedure and the allocation of benefits according to AsylLG could be significantly accelerated for refugees. Blockchain-based currencies can also contribute to the financial inclusion of refugees.

The United Nations World Food Programme has been successfully testing a pilot project, "Building Blocks", at the Azraq refugee camp in Jordan for a few months, in which ten thousand refugee Syrians can now use blockchain technology to pay for their food through an iris scan. The technology for this comes from Germany.

4. **Digitization of existing registers**

Existing public registers can be digitized by the blockchain technology. This would, on the one hand, strengthen the transparency and trustworthiness of these publicly kept books and, on the other hand, reduce personnel and infrastructure expenditure. The land register, the commercial register, the trademark register and many more are obvious examples. The transfer of real estate in Germany is nowadays regarded as slow, inefficient, paper-based and linked to high transaction costs. In international comparison, the land register is therefore the most widely used public register system, which is digitized by means of blockchain.

5. **Testing of a decentralized micro-grid**

Analogous to the successful pilot project "Brooklyn Microgrid" with German participation, a decentralized smart grid for the generation, sale and consumption of electricity without intermediaries and with adequate data protection is to be tested in a test environment.