Main Chapter I: Introduction and Overview

1. Introduction to Digital tax Law

1.1. The added value of a digitalized tax process

1.1.1. Summary

The vocabulary associated with the concept of digitalization, including terms such as big data, artificial intelligence, blockchain, Industry 4.0, ChatGPT 4.0, large language models (LLM) and the term „digitalization" itself, is currently a dominant feature of public discourse. It is argued that digitalization is fundamentally and comprehensively changing society, affecting not only the economy, administration and science in general, but also the tax and customs sector in particular. A comprehensive transformation of national economies and every single company is predicted. This brief introduction to the topic elucidates the concept of Tax Law Technology (TaxTech), which is defined as a key element of the incipient transformation. The triad of „people, processes, data/technology" is the foundation of this book. In 1964 Harald Leavitt[1] developed the Leavitt's Diamond Model. It consisted of four parts: people, tasks, structure, and technology. He simplified the model to three important things: people, processes, and technology. It was later developed into a Venn diagram of a „golden triangle" (PPT) in which tasks and structure became part of the process. Due the importance of Data this book highlights Data/ Technology as a further development of the model.

Figure 1.1: Digital transformation People, Process, Technology by ats-global (https://www.ats-global.com/resources/blogs/people-process-technology-how-the-golden-triangle-drives-digital-transformation/, retrieved Aug 15, 2024)

The consequences of digitalization for the tax function of a consulting firm, a company or even a tax authority are discussed from this transformational perspective.

A standardized case study (The CASE AG) for various chapters is presented to combine the various elements and provide an initial understanding.

1 Leavitt, H. J. (1962). Toward organizational psychology. In B. v. H. Gilmer (Ed.), *Walter van Dyke Bingham: Memorial program March 23, 1961* (pp. 23–30). Carnegie Institute of Technology. https://doi.org/10.1037/13362-003.

1.2. Pull of demand and technological pressure

1.2.1. Pull of demand

The tax function in general has been changing considerably for years. The new requirements such as the

- challenge to the scope of work: „more for less"/ „doing more with less" (cost pressure);
- liberalization and deregulation of markets in the context of globalization (global regulations for transfer pricing, customs and currently for income tax in BEPS 2.0, Pillar 1 + 2 but also Green Deal 2030 of the EU Commission);
- increasing tax complexity, dynamics, uncertainty and lack of transparency of new regulations (BEPS 1.0 and 2.0 initiatives of the OECD), including for smaller companies;
- sustainability discussions, referred to as ESG (Environmental Social Governance) for short, are leading to overarching corporate governance or are seen as part of the topic of corporate governance and sustainability; and
- the new plastic tax, CO2 levy (CBAM) etc.

lead to new challenges.

Comparatively speaking, research into legal informatics has been concerned with the change in the perception of legal activities since the beginning of the 1990s. The practice of law has evolved into a marketable service. Richard Susskind's 2017 book, Tomorrow's Lawyers, in which he made a widely cited prediction, appears to have already become a reality. He postulated that the commercialization of legal services in legislation, jurisdiction, administration, or consulting was an inevitable consequence. This was accompanied by an intensification of competition between legal service providers and mounting cost pressures. This led to a highly competitive environment for legal services.

It is similarly important to consider the impact of megatrends on the tax function in companies, in the consulting sector, and in tax authorities. The demographic shifts that will result in a decentralized deployment of work (keyword: home office) may potentially lead to growing quality gaps based on different levels of training and experience. In addition to demonstrating a high level of process knowledge regarding tax and customs, tax employees in shared service centers (SSCs) must also possess sufficient specialist knowledge of tax and customs requirements. Furthermore, the redistribution of global economic power is leading to investments in developing countries that may not have well-developed tax laws. This phenomenon gives rise to an elevated tax risk and a proliferation of complexities in the implementation of international cross-border tax regulations, such as transfer pricing rules. The lack of transparency in tax laws is becoming increasingly prevalent. Moreover, even implemented laws must remain comprehensible. It is imperative that the will of the legislature be upheld. In particular, in the context of increasing technical complexity, there is a need to ensure that there is no lack of power in the implementation and realization of new technical possibilities.

In order to ensure the continued safeguarding of the efficiency of taxation and the avoidance of any jeopardy to the requirements regarding the fairness and uniformity of taxation, it is necessary that the new legal requirements provide for this. Furthermore, the operational transformations also result in demands for higher quality, efficiency, and lower costs. The aforementioned changes in legislation continue to lead to the imposition of stricter regulations and compliance requirements (keywords: payroll tax, VAT, customs regulations, transfer pricing, and national/international withholding taxes) and to greater transparency in terms of how tax compliance is implemented by taxpayers. According to the OECD, this tax transparency will become the new standard for all countries. The exchange of information between tax administrations will now occur on a request basis, as well as automatically or, for instance, on an annual basis in the form of country-by-country reports (BEPS 1.0 action point 13). These reports will eventually evolve into a global system for the reporting of tax information. A total of 130 countries have consented to the practical implementation of the „Inclusive Framework." The practical implementation of this initiative in various countries is resulting in an increasing divergence in tax complexity. This is exemplified, for instance, in the comprehensive legislation and in the supply chains of a company (keyword: supply chain laws). Tax systems are characterized by a high degree of detail, which enables them to encompass both general regulations and a multitude of individual cases within the scope of taxation. The objective is to utilize the technology described to facilitate the accurate and sim-

plified implementation of the new tax laws. Furthermore, it is necessary to determine which tasks should be outsourced or automated in order to achieve greater efficiency and release economies of scale. Information technology can facilitate the coordination of the various tasks undertaken by the work groups involved. These effects arise specifically in the case of outsourcing, in the case of joint service centers and long-term business partnerships („business partnering"), for example, through the assumption of tax tasks by a tax consultant. This expansion of the tax function's task profile is a consequence of this approach. For instance, internal control systems are being implemented to monitor compliance requirements (keyword: Tax Control Framework, TCF of the OECD).

Moreover, the advent of technological „breakthroughs" in digital business, such as ChatGPT/LLM, has necessitated the acquisition of new skills. The emergence of new market participants is contributing to an intensification of tax dynamics. The business models of companies grouped under the synonym GAFA (Google, Apple, Facebook, Amazon) have considerable growth potential, particularly in the area of digital offerings whose profits are difficult to capture for tax purposes. This is due to the difficulty of determining the value of digital products and services, which are often delivered through e-commerce platforms and are subject to Value Added Tax (VAT) regulations. In order to accurately record these profits for tax purposes, it is necessary to define what constitutes digital value creation in legislation. In light of these transformations, it is clear that there is a pressing need for a rapid change in tax systems and the enactment of new laws in various countries.

> One of the most common ways to overcome resistance to change is to educate people about it beforehand. Communication of ideas helps people see the need for and the logic of a change. The education process can involve one-on-one discussions, presentations to groups, or memos and reports. (John Kotter)

New skills are required in the tax function in companies, in the advisory profession and in tax administrations. Several countries, such as Brazil, Italy, Poland and Spain, have begun to introduce real-time reporting on tax returns, such as a so-called SAF-T report. These „Standard Audit File-Tax" (SAF-T) reports use accounting data to build a risk system for tax authorities, starting with European VAT. The aim is to respond to tax compliance requirements in real time. In Finland, individual taxpayers are no longer required to complete tax returns. The Finnish tax administration receives most of the information it needs directly from third parties such as employers, banks and insurance companies.

In addition, the new structures in the European Union (keywords: Brexit, Ukraine war, energy crisis) have significant tax and customs implications. These issues will now affect business life in detail from 2023 onwards.

Various companies and organizations have developed a „roadmap" for future development from the change management associated with the above developments (see John Kotter), which also appears to be important for tax and customs processes.

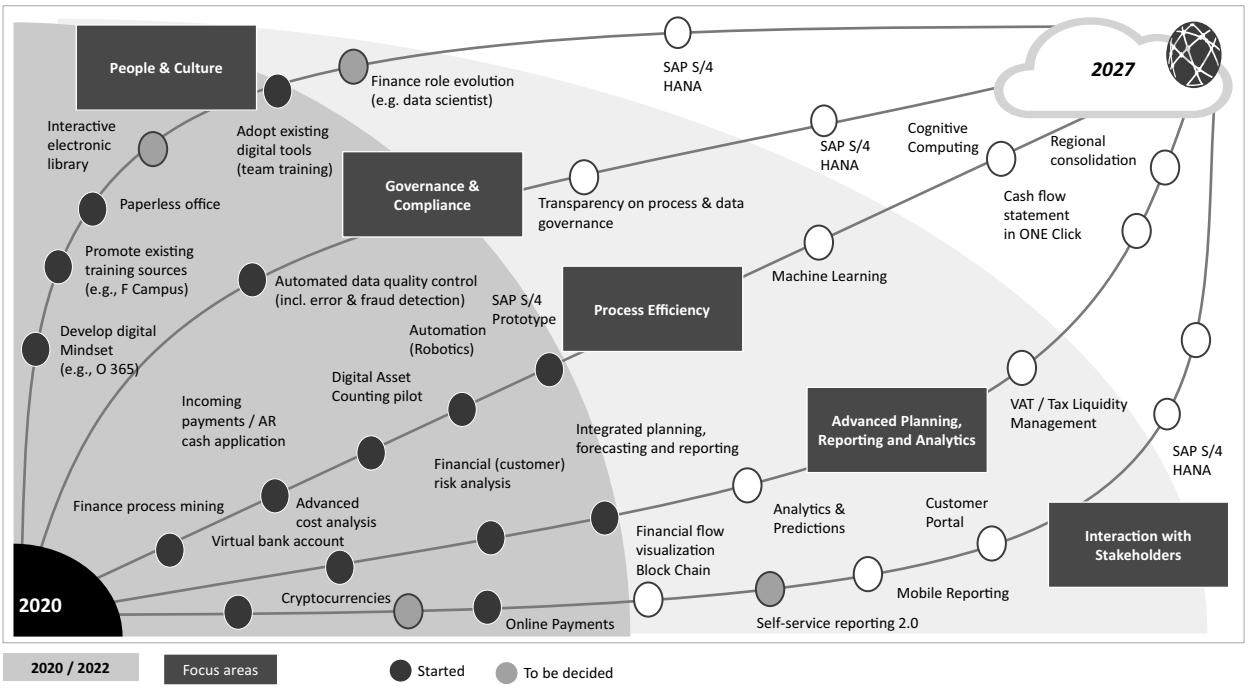

Figure 1.2: Own illustration of the individual points for a digital roadmap

1.2.2. Technological pressure

At the same time, in addition to the need for new solutions, there is pressure from new technical possibilities to change the existing control area. New technologies are particularly relevant here:

- data storage
- data processing and
- communication.

The first point to be considered is that data is increasingly being processed digitally. The maximum data volume that can be stored has increased considerably, as has the speed with which data can be accessed. Consequently, more data is stored. The term „big data" has emerged as a catchphrase to describe these developments.

Point 2) There has been a significant increase in the processing power and cost-effectiveness of computers, which are now capable of handling vast amounts of data. Concurrently, the size and prevalence of computing machines are both shrinking. Additionally, new quantum computing and artificial intelligence technologies promise to facilitate novel forms of processing. The Chinese company Alibaba is already utilizing quantum computing for the development of new navigation computers, which are capable of calculating individualized routes for drivers.

Thirdly, there are opportunities for faster data communication. It is now possible to exchange data while in motion, and the advent of smartphones has enabled a novel form of information exchange.

The changes in society that have been triggered by the pressure of technology and the pull of demand are often summarized under the keyword „digitalization", which will be examined in more detail below.

Digitization and its variants

In addition to the process of digitalization, there is also discussion of the possibility of a digital revolution or digital transformation. The term „digitalization" is often employed in disparate ways.

The term „digitalization" is employed in a manner that is both inflationary and heterogeneous, with the meaning of the term often unclear. This introductory chapter identifies three core meanings associated with the term „digitalization." It is assumed here that the term „digitization" is used in three different senses.

- First core meaning: Originally, digitization refers to a form of data storage that is the opposite of „analogization". Digital is the opposite of analog. Digital means representing values with digits. Today, computers work digitally and have made great progress. Digital processing means that data is represented by characters or symbols. The fact that a lot of content such as written texts, spoken language, music, images, videos and much more can be stored, transported and ultimately processed digitally has made a wide range of developments possible. This is also the original meaning of digitization, which has since been broadened.
- Automation through new information technology: This enables the automation of previously manual tasks. This is not about the automation of physical work, which is increasingly being carried out by machines or robots. The core idea is to have work performed by machines rather than humans, i.e. to carry out a substitution. Which tasks can be substituted, whether these are mass tasks, routine tasks, etc., is the subject of intense debate. There is talk of a second machine age in which mental or cognitive tasks are carried out by a machine. These changes are so far-reaching that there is now even talk of a second industrial revolution. During the Industrial Revolution in the 18th and 19th centuries, physical work was automated; in the so-called second machine age, the 21st century is seeing the automation of mental work. The new technologies are permeating our society, economy, science and also the tax and customs sectors.
- Digitalization describes the emergence of new business models. In addition to automation, however, there is a third core meaning of digitalization, which also has to do with automation, but ultimately aims to create completely new opportunities. This is why people like to talk about new business models in this context. It should not be overlooked that this is actually nothing unusual in a market economy system. When it comes to new business models, GAFA (Google, Amazon, Facebook and Apple) is often singled out as large digital platforms that offer a wide range of opportunities for new product developments. These changes have already affected other business models.
- Similar developments are emerging in the various areas of law. The most important fields of application of digital law are IT and intellectual property law, consumer protection, e-commerce, FinTech, employment law, data protection, cyber security, knowledge representation and knowledge modeling. Legal issues of digitalization such as IT law, IP law, data protection, liability, digital contract law, legal issues of the digital world of work, consumer protection, digital dispute resolution and the legal regulation of algorithms. Focus on information security and various forms of cybercrime. areas of „e-justice" and „e-government". What limits do the Legal Services Act and the law governing the legal profession impose on automated law enforcement?

1.3. Taxes and information technology, exemplary highlights

The advent of digitalization as a general phenomenon has now also reached the tax sector, as evidenced by several developments:

- The tax consultant platforms are dedicated to the topic of artificial intelligence.
- Many conferences of the are dedicated to the topic of digitalization and artificial intelligence
- German Handelsblatt „Der Betrieb" publishes a special issue on „Tax Technology" and launches a new product range in 2019, which includes the magazine „Re:ThinkingTax" in addition to „Re: Thinking Law" and „Re:Thinking Finance".
- C.H. Beck Verlag publishes the technical developments in beck.digitax
- New blogs and podcasts are created, such as taxtech.blog.
- Conferences and professional courses.
- Consulting firms organize a tax technology branch or set up their own departments or spin-offs in corporations that specifically relate to digitalization.
- The chambers of tax advisors are setting up a committee that also deals explicitly with artificial intelligence issues.

These examples show that a lively discussion is currently taking place at the interface between „taxes and information technology". There are three different aspects to the discussion:

(1) Gartner assessments in the so-called Hype Cycle
(2) Taxation of digitalization / automation / information technology.
(3) Digitization / automation / information technology of taxation.

Gartner's Hype Cycles offer a visual representation of the evolution and adoption of technologies and applications, as well as their potential to address real-world business challenges and seize new opportunities. Gartner's hype cycle methodology provides an overview of the evolution of a technology or application over time, offering a reliable source of insight to inform its deployment in the context of specific business objectives.

The market research firm Gartner has recently updated its Hype Cycle for emerging technologies. The topics of trust creation, acceleration of growth, and shaping of change are addressed. These are the areas that will determine which of the emerging technology trends will prevail.

The Gartner Hype Cycle is a graphical representation of the perceived value of a technology trend or innovation, as well as its relative market promotion. The cycle can assist in comprehending the evolution of the perceived value of a given technology throughout its maturity lifecycle.

The maturity lifecycle encompasses several phases. Initially, there is a period of excessive enthusiasm among industry members upon the introduction of the technology. This is followed by a phase of mass adoption, during which the technology is evaluated in terms of its promised value. Subsequently, there is a period of maturation, during which the technology is improved. Over the course of this lifecycle, the Gartner Hype Cycle speculates on the potential growth trajectory and value that can be obtained by exploiting the technology in its current and next maturity phase.

This snapshot enables organizations to address a pivotal question that arises with the advent of any new technology innovation: whether to invest in the technology.

According to the methodology employed by Gartner, a technology innovation progresses through five distinct phases of its maturity cycle. Gartner employs a number of market indicators in order to ascertain a true representation of the anticipated value and maturity phase of a technology innovation. The aforementioned phases may be defined as follows:

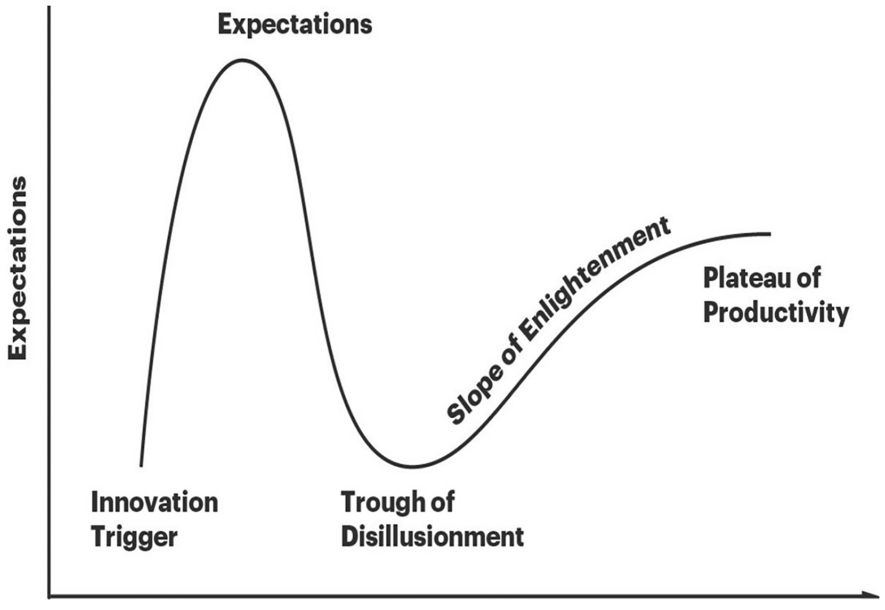

Figure 1.3: Gartner Hype Circle explanation

The innovation trigger is the initial stage of a technology breakthrough. It can be a product, process, concept, trend, or idea that attracts media attention and is considered a legitimate breakthrough. Early adopters investigate the technology, which is characterized by its novelty, high price, and the expectation of a high degree of customization as it matures. The technology is retrieved only to limited entities such as research labs and startup companies. Media attention and popularity of the technology breakthrough cause the expected value to rise steeply until it peaks. Lack of mass adoption means that the technology's commercial viability is unproven, but not yet challenged by rising expectations.

At the peak of inflated expectations, the technology is widely publicized. Vendors use it as a buzzword in marketing campaigns, and investors and customers see it as a hot technology. This stage often sees a pro-

liferation of vendors flooding the market with complementary and competing products. Many organizations rush to adopt, seeking the early mover advantage, while others are wary of the limited failure stories that begin to emerge in the industry. Early adopters typically risk the challenges associated with a technology that may take years to reach the desired level of maturity. At the peak of this phase, some startups that pioneer the technology breakthrough may see high-profile acquisitions by large companies.

Trough of Disillusionment: Soon after a technology innovation reaches the peak of inflated expectations, we see activity beyond the early adopters. Negative press often appears. Organizations now look for meaningful value beyond the initial success stories and industry hype. As the technology fails to meet high expectations, adoption growth is slowed or delayed. Vendors consolidate their offerings as experiments fail and variations fail to gain sufficient market traction. Successful vendors reach Series B or C funding rounds with improvements validated by early adopters. The technology evolves into its next generation with only a small percentage (up to 5%) of the audience adopting it. Toward the end of this phase, the industry questions the transformational potential of the technology. Media outlets frequently highlight the challenges, failure, and backlash facing early suppliers and adopters of the technology. Examples for this phase are Blockchain or Augmented Reality.

In the phase of Slope of Enlightenment, the technology innovation has now undergone enough success and failure stories, updates, and improvements for the industry to understand an optimal path of growth trajectory. Accordingly, second and third generations of the innovation emerge, presenting proven solutions to specific problems and industrial use cases. As a result, adoption rises closer to 20% of the audience as the technology reaches its next maturity phase. Consulting companies are able to provide methodologies and frameworks to assist new adopters. The resulting case studies and adoption statistics are reliable, and the perceived value is now closer to reality. Toward the end of this phase, most conservative adopters and industry laggards are yet to incorporate the technology innovation to their adoption agenda soon.

In the end at the Plateau of Productivity there is a mainstream adoption (30% or more of the audience). Media outlets and technology experts regularly publish relevant news, best practices, and insights on future updates. The technology is readily produced and available as an off-the-shelf solution. A growing community builds around the technology and an ecosystem of relevant products and services emerges. Successful adoption stories across a variety of industry verticals are observed like speech recognition.

Gartner has mapped the trends for digitalisation in the „Hype Cycle for Emerging Technologies" for 2021.

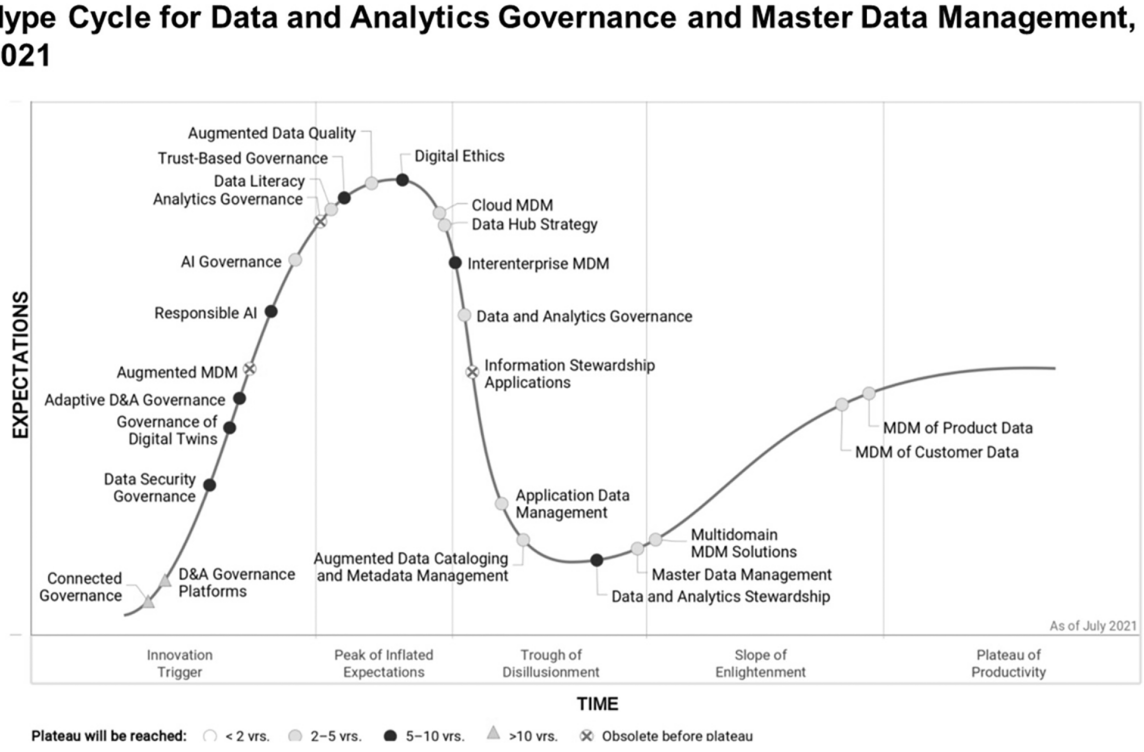

Figure 1.4: Gartner Hype Circle 2021 (https://www.gartner.de/de/insights/hype-cycle-innovation-durch-vertrauen-wachstum-wandel, assessed June 2025)

Just two years later, many digital innovations reach the Slope of Enlightenment phase, reflecting the rapid pace of digital development.

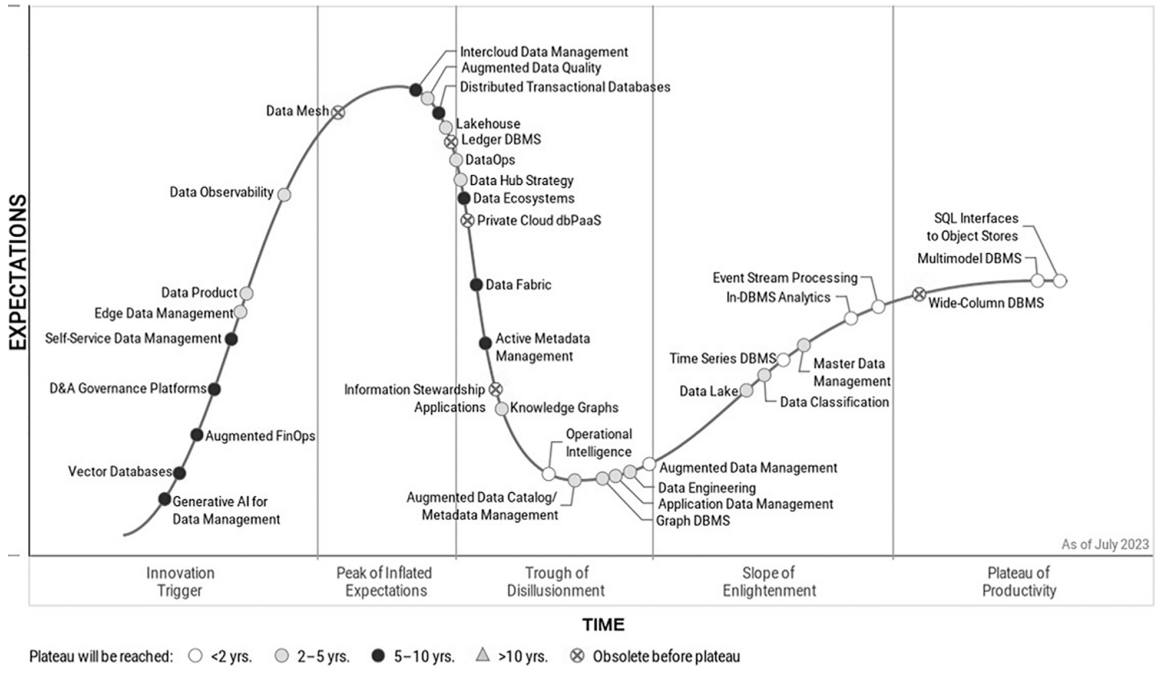

Figure 1.5: Gartner Hype Circle 2023 (https://www.gartner.de/de/insights/hype-cycle-innovation-durch-vertrauen-wachstum-wandel, assessed June 2025)

In addition, the Tax Trend Radar for 2020 also provides information on the areas of application of digital tax law that extend beyond the areas mentioned by Susskind. For tax evaluations and automated compliance executions, a company requires a substantial amount of data that is not solely derived from texts or other text-based rules. The interfaces between accounting, controlling, and operational processes, such as purchasing, production, logistics, or sales, and tax law are addressed in the Tax Trend Radar. The classification of trends according to services, processes, technologies, and the political environment is driven by a number of developments.

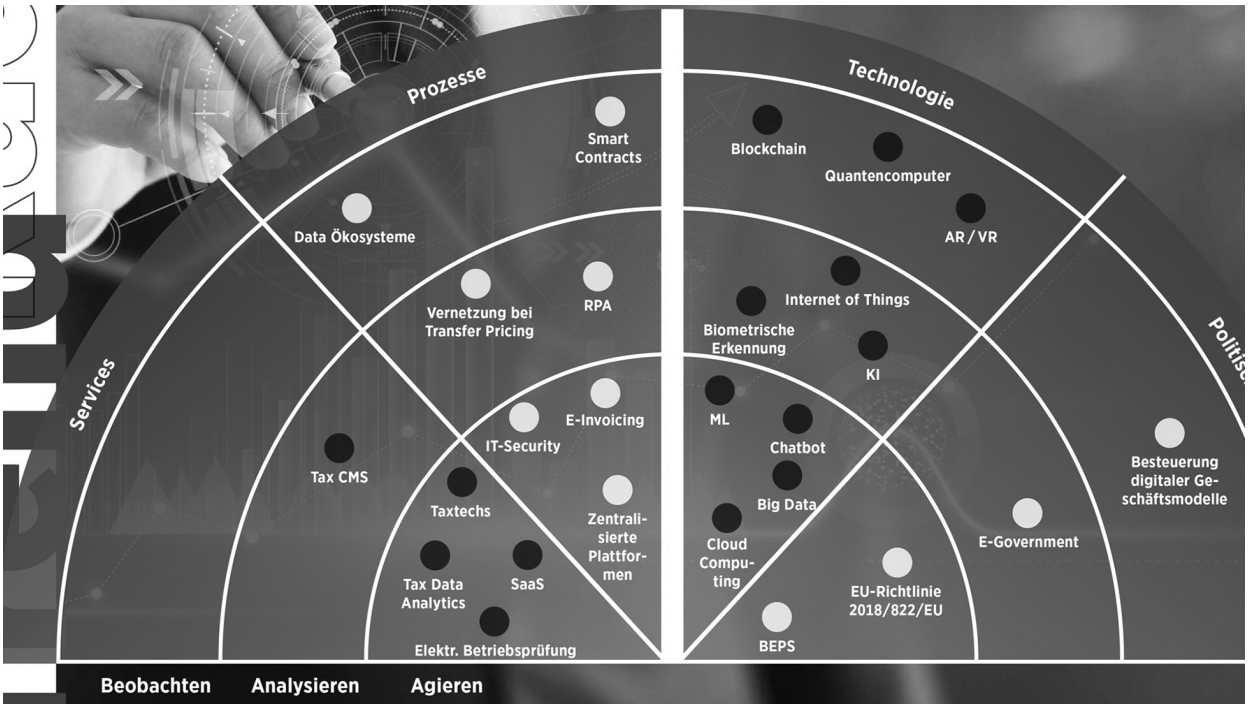

Figure 1.6: Tax Radar (Tax Trendradar p. 14)

Exercise 1.3

Why is change management so relevant for the developments in Tax law?

1.4. Taxation information technology

Information technology can be used to support taxation. There are three basic starting points here. Figure 1.7 provides an initial structuring of the topic by naming the central players whose tasks are affected by the use of information technology:

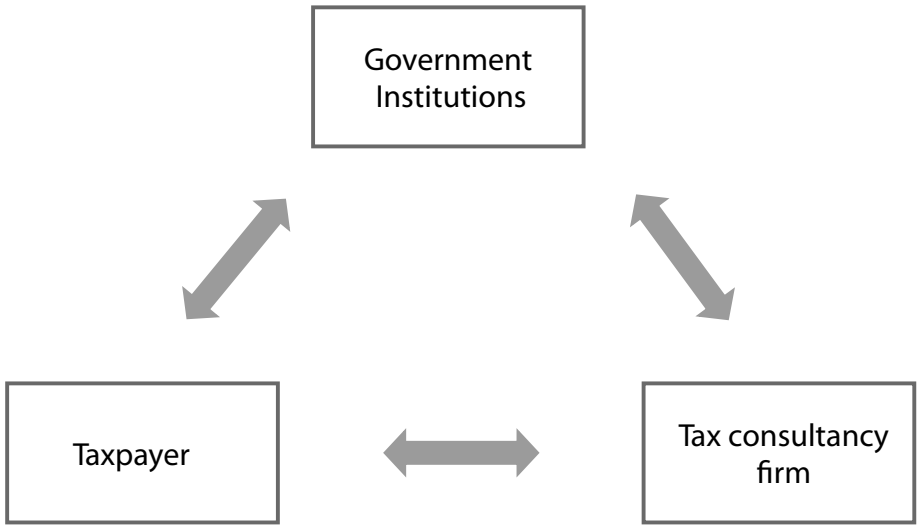

Figure 1.7: Key players in a tax information system (own illustration)

- Taxable Person: The term „taxable persons" encompasses both private individuals and companies. In the case of companies, it is noteworthy that all operational tasks pertaining to the taxation of a company with a certain size are consolidated in a tax department that has been established for this purpose, as the complexity of the tasks cannot be managed otherwise.
- Tax consulting firms: Tax consulting firms provide services related to tax consulting. Furthermore, they frequently provide supplementary consulting services in the domains of auditing, law, and general strategy consulting.
- State Institutions: The tax authorities and tax courts are responsible for establishing the laws, decrees, standards, and other framework conditions that regulate the payment of taxes. Information technology can be employed in the aforementioned activities.

The above-mentioned players have a plethora of opportunities to utilize information technology, which has led to a multitude of intriguing questions and developments. For instance, the utilization of electronic balance sheets, which is now legally mandated for the transmission of (tax) company balance sheets, is a case in point. Portal technologies are propelling the advent of novel advisory approaches in tax law. In addition, existing taxation systems must be adapted in light of digital business models and new technologies such as 3D printing.

It is obvious that there are dependencies here:

- *Taxpayer – Tax authority*: The type of interface for accessing tax data or transmitting declaration data has been the subject of intense debate for decades.
- *Tax advisor – client*: The way in which tax advisors work with their clients, for example, how documents are sorted and how advice is provided, is an exciting question.
- *Tax administration – Tax consultant*: The tax consultant also has an interface that can be configured electronically.

In order to illustrate and examine the possibilities and limitations of new information, communication, and computing technology for the control sector, it is essential to have a better and more concrete understanding of the technologies to be discussed.

1.5. Goal and purpose of the Tax Law Technology Principles

The three central tax disciplines that deal intensively with issues relating to the taxation of digitalization are business taxation, public finance, and legal tax law. There is a plethora of explanations concerning the digitalization of taxation. Nevertheless, a comprehensive overview that provides a well-founded overview of the concepts, methods, and techniques that play a role in the design of tax aspects of business application systems is still lacking. Nevertheless, there is considerable potential for further research in this area.

- The tax sector as a field of application is clearly defined, strongly characterized by a specialist vocabulary, is based on large amounts of data in many areas and many tasks are highly repetitive routine activities. These are all ideal prerequisites for further digitization and automation of tasks in the tax sector.
- The training examines the tax area from the perspective of an application system in the operational tax function. A tax information system is an application system that provides information technology support for various tasks that arise in the context of taxation.

The design and transformation of application systems is currently underway, with a plethora of technical concepts, methodologies, systems, and tools being employed. Against this background, the training course aims to provide an introduction to this subject area. The course has several objectives.

- The necessary technical background knowledge is described and
- the technical elements are illustrated using specific application, case and practical examples.

It is evident that these abilities can only be cultivated in a preliminary manner and not to their full technical extent. This is evident from the fact that the technical and scientific development of the majority of the technologies mentioned is incomplete, yet ongoing, and that for the majority of the technologies mentioned here, there is a substantial corpus of technical and scientific literature dedicated exclusively to a specific technology or family of technologies.

This context is described here by way of introduction, with the example of deep reinforcement learning. This particular field of study is a subfield of reinforcement learning and deep learning, which in turn can be understood as part of machine learning. Machine learning, in turn, represents a significant subfield of artificial intelligence research. Artificial intelligence, in turn, is a subfield of computer science, which has its roots in mathematics and engineering. The following example illustrates two aspects.

- Scope of topics: There are established university textbooks and lectures for each of the topics mentioned above.
- Complexity and transdisciplinary: Notwithstanding the fact that the interrelationships have merely been presented as subfields, there are numerous links between them. For instance, AI research has a significant foundation in the cognitive sciences, which are typically situated outside the computer science faculties and have numerous connections to psychological and medical research. Additionally, there is a significant domain of application, business informatics, which has numerous roots in economics, particularly business administration. However, it is crucial to note that it is not to be understood as part of computer science. Nevertheless, it does encompass crucial areas pertaining to taxation issues. This illustrates that this is a transdisciplinary endeavor.

It goes without saying that not all content can be dealt with in full depth in this discourse and subject area, but that only an overview can be given for many contents in order to classify them and also to present connections. No tax or information technology assumptions are made in the presentation.

1.6. Recap

The initial chapter presents a comprehensive examination of two discrete domains: the first elucidates the influence of green technology, environmental taxation, and natural resources on energy efficiency and productivity within the context of Organization for Economic Co-operation and Development (OECD) countries, while the second delves into the diverse applications and regulatory intricacies of artificial intelligence (AI) in the domain of tax law. The following key themes are addressed: