ANNEX 4– INNOVATIVE TECHNOLOGIES

IV – USE OF INNOVATIVE TECHNOLOGIES

Part 4 delivers a comprehensive overview of technologies and techniques actively shaping the tax landscape, both in current practice and with regard to future transformations. The chapter serves as a guide, shedding light on the mechanisms that contribute to enhancing the efficiency of tax administrations. It provides readers with explanations of key terminologies and also ventures into the expansive area of application possibilities, offering an understanding of how these technologies can be used in practice.

A useful feature of this chapter lies in the utilization of the Institut für Digitalisierung im Steuerrecht (Institute for Digitization in Tax Law - IDSt) maturity level as an evaluative framework. Within the IDSt the Committee for “Innovative Technologies in Taxation”, consisting of experts in this field (from tax authorities, companies, academia and tax consultants), has made an assessment based on its extensive practical experience.

This framework becomes a lens through which readers can assess the developmental progress of these technologies, particularly concerning their applicability within the tax environment. By employing the IDSt maturity level, a detailed examination of the technological evolution is provided, guiding readers through the current state of these advancements. Furthermore, the concept of relevance within the context of the IDSt framework enriches the compendium. This dual perspective enables readers to comprehend not only the immediate impact of these technologies but also the enduring role they are poised to play in shaping the landscape of tax-related activities.

Chapter 8 goes beyond mere definitions by showcasing specific tax use cases under the “concrete use” section. These real-world or potential future examples illustrate how these technologies seamlessly integrate into the tax environment, bringing about tangible improvements. Through the illustrative use cases, the transformative potential of these technologies is illuminated, and it becomes evident that the chapter is a dynamic exploration of the evolving landscape where technology and taxation converge. In navigating through this chapter, readers are not only equipped with knowledge but are also empowered to envision the future contours of tax functions, shaped by technological progress.

CHAPTER 8 – INNOVATIVE TECHNOLOGIES

8.1. Introduction

Innovative technologies can help tax administrations in several ways. Here are some examples:

Automation: Artificial Intelligence (AI) and Robotics Process Automation (RPA) can help tax administrations to automate a wide range of tasks, including data entry, document processing, and even decision-making. For example, AI-powered chatbots can help to give taxpayers answers to common questions, while RPA can automatically generate tax assessment notices and other documents. Automation can help reduce the workload on tax administrators and improve the speed and accuracy of tax-related tasks.

Data Analytics: (Big) Data Analytics, especially Business Intelligence (BI), can help tax administrations to identify non-compliant taxpayers and take appropriate action. For example, tax authorities can use predictive analytics to identify taxpayers who are at high risk of non-compliance and target them for audit. Data Analytics can also be used to identify trends and patterns in taxpayer behaviour, which can help tax authorities to develop more effective compliance strategies.

Distributed Ledger: Blockchain technology as one specific type of Distributed Ledger, can help tax authorities to create a more secure tax system. For example, blockchain can be used to create a tamper-proof record of tax-related transactions, which can help prevent fraud and improve compliance (e.g. VAT and TP). Blockchain can also be used to enable more efficient sharing of tax-related data between different tax authorities, improving collaboration and reducing the risk of data loss or corruption.

Cloud computing: Cloud-based systems can help tax authorities to access and share data more easily and securely. Cloud-based systems can be designed to be scalable, flexible, and cost-effective, enabling tax authorities to manage their data and applications more efficiently. Cloud-based systems can also provide tax authorities with real-time access to data, enabling them to make more informed decisions.

Electronic filing and payment: Electronic filing and payment systems can provide taxpayers with a more convenient and efficient way to file their tax returns and pay their taxes. These systems can be designed to be user-friendly and secure and can provide taxpayers with real-time feedback on the status of their filings and payments. Electronic systems can also help tax authorities to reduce the cost and complexity of tax administration.

The latter example shows that the use of innovative technologies by tax administrations can be beneficial for tax authorities themselves but also for taxpayers. It can improve taxpayer experience and reduce the administrative burden on taxpayers. Other examples are AI-powered chatbots as mentioned in the first example: they are useful for tax authorities as they relieve the staff from burdensome and time-consuming work. At the same time they can provide taxpayers with instant answers to their tax-related questions. Overall, the aim of applying innovative technologies should be to help tax administrations to improve efficiency, accuracy, and compliance and equally to enhance the taxpayer experience.

8.2. Artificial Intelligence (AI)

Maturity for tax use: 70%
Relevance for tax use: 90%

The use of artificial intelligence (AI) as a branch of computer science is gaining significance in the intricate domain of taxation, signalling the inception of a transformative era. The multifaceted landscape of AI encompasses not only rule-based IT systems but also delves into the realms of machine learning systems and cutting-edge deep learning technologies. At its core, AI encapsulates the capacity of an IT system to emulate intelligent and human-like behaviours. In this context, the control area is virtually predestined for the use of AI. In many cases, a good and representative database can be used ("Big Tax Data").

In addition, there are a large number of repetitive activities that lend themselves to AI-supported automation. Finally the use of generative AI (here: Natural Language Processing – NLP) can help tremendously in searching and analysing existing text as well as generating new text. The evolutionary trajectory of AI in taxation is poised to revolutionize traditional paradigms. As AI algorithms continuously refine their capabilities through iterative learning processes, the tax landscape stands to benefit from increasingly sophisticated and precise decision-making. The synergy between tax professionals and AI technologies becomes a symbiotic partnership, leveraging the strengths of each to create a comprehensive and adaptive approach to tax management.

From a tax administrations perspective, the use of AI in the field of taxation is a development that is gaining importance. AI, defined as the ability of an IT system to exhibit intelligent, human-like behaviour, can be utilized in various forms, such as rule-based systems, machine learning systems, and deep learning technologies. The control area in taxation is particularly suited for the use of AI. By leveraging large databases, referred to as "Big Tax Data," AI systems can analyse vast amounts of information and identify patterns, anomalies, and potential

tax issues more efficiently than manual processes. This enables tax authorities to make better-informed decisions and allocate their resources more effectively.

One of the main advantages of using AI in taxation is the ability to process vast amounts of data quickly and accurately. This can lead to increased efficiency and improved compliance with tax regulations by identifying errors or potential issues that may have been overlooked in traditional methods. Additionally, AI-supported automation can free up resources for more complex tasks that require human decision-making. AI can be particularly valuable in automating repetitive tasks in taxation. Many tax-related activities involve following established rules and procedures, which can be performed by AI systems without human intervention. This includes tasks such as data entry, document processing, and basic compliance checks. By automating these routine activities, AI can free up human resources to focus on more complex and value-added tasks, such as tax planning and analysis.

Furthermore, AI-powered systems can improve the accuracy and consistency of tax assessments. Machine learning algorithms can be trained on historical tax data to identify patterns and predict potential tax risks or areas of non-compliance. By leveraging these insights, tax authorities can enhance their audit processes and target their resources more effectively. However, it is important to note that the development of AI in taxation is still in its early stages. Challenges related to data quality, privacy, and interpretability of AI models need to be addressed. Ethical considerations, fairness, and transparency are also crucial when implementing AI systems in tax-related decision-making.

It is therefore also important to note that AI should not replace human tax experts entirely. While AI can process data at a greater scale and speed, it may lack the analytical skills and ability to interpret information in the context of unique situations. Therefore, the integration of AI into taxation should be seen as a complementary tool rather than a replacement for human expertise. Overall, as AI technologies continue to advance and organizations accumulate more tax-related data, the use of AI in taxation is likely to grow, enabling more efficient and effective tax administration.

8.2.1. Generic fields of application:

a. Repetitive activities
b. Research activities or knowledge acquisition activities
c. Data / document analyses

8.2.2. Concrete use cases:

a. Repetitive activities:

- Assistance systems, e.g. for the treatment of series transactions, withholding tax deduction or incentives
- Support in tax determination in the area of VAT
- Assistance in the determination of tariff proposals in the customs area
- Automatic accounting machines or accounting detectors for the validation of accounting records.
- Recognition and analysis of tax assessments, such as in the area of business tax or real estate tax

b. Research activities or knowledge acquisition activities

- Finding the appropriate case law, administrative instruction or literature opinion based on the context by means of an artificially created understanding of the search query.
- Intelligent briefs with alert function, which indicate the need for tax action (=> NLP – Natural Language Processing)
- Contract analyses

c. Data analysis

- Use of machine learning to enrich or combine with BI solutions (=> BI – Business Intelligence) and Tax CMS instances
- Continuous auditing via predefined pattern recognition in the area of sales tax or payroll tax
- Detection of violations of transfer pricing guidelines or compliance with the interest barrier

8.3. Natural Language Processing - NLP

Maturity for tax use: 40%
Relevance for tax use: 90%

Natural Language Processing ("NLP") is a subfield of "Artificial Intelligence" and stands for techniques and methods for the machine processing of natural language, especially in the form of text. In simple terms, NLP is a methodology that interprets texts based on algorithms and classifies them in the correct context. This should enable tax administrations to find the appropriate case law, administrative opinion or commentary literature for any tax issue without human intervention. It is precisely against this background that NLP is gaining in importance for the targeted support of research activities, also in the area of taxation.

As a subfield of Artificial Intelligence (AI), NLP focuses on the interaction between computers and human language. In the context of taxation, NLP can be a valuable tool for researchers and professionals. Here are a few ways NLP can support research activities in the field of taxation:

- Document Analysis: NLP techniques can be used to analyse vast amounts of tax-related documents, such as case law, administrative opinions, and commentary literature. By automatically extracting relevant information from these texts, researchers can quickly identify key insights and precedents.

- Information Retrieval: NLP can enhance the search capabilities for tax-related information. By using algorithms to understand the context and intent of a query, NLP systems can retrieve relevant documents, cases, or opinions that match the user's needs more effectively.

- Sentiment Analysis: NLP can analyse the sentiment or emotional tone expressed in tax-related texts. This analysis can help identify public opinion, attitudes towards specific tax policies, or reactions to legislative changes.

- Automated Summarization: NLP algorithms can automatically generate summaries of lengthy tax documents. This can save researchers significant time by providing concise overviews and key points from complex texts.

- Taxonomy and Categorization: NLP techniques can assist in organizing tax-related information into meaningful categories or taxonomies. By automatically classifying documents based on their content, NLP systems can help researchers navigate through large datasets and identify relevant materials.

While NLP can provide valuable support in tax research, it's important to note that, just like AI, it is not a replacement for human expertise. The interpretation and analysis of tax laws often require a deep understanding of legal and regulatory frameworks, which currently exceeds the capabilities of NLP systems alone. However, NLP can augment human efforts by accelerating information retrieval and analysis processes, enabling researchers to make more informed decisions efficiently.

8.3.1. Generic fields of application:

a. Interpretation of unstructured data
b. Classification of text and language in the professional context
c. Finding literature on the same topic

d. Knowledge management within an organization

8.3.2. Concrete use cases:

a. Finding the appropriate case law, administrative instruction or literature opinion based on the professional context.
b. Use of the specific tax knowledge available in an organization, created and available in documents of different formats.
c. Possibility to issue automatic notices when legislation or case law changes in relation to a tax issue (Intelligent "Alert" function)
d. Analysis of tax notices (possibly in combination with => OCR – Optical Character Recognition)
e. Analysis of contracts (if necessary, in combination with => OCR – Optical Character Recognition)

8.4. Blockchain

Maturity for tax use: 80%
Relevance for tax use: 90%

The blockchain functions as a decentralized database that is mirrored in the network on a large number of computers. Each entry in the blockchain is represented by an (information) block. Each block entry in turn represents a "life issue" or transaction. The blocks are cryptographically linked in such a way that it is fundamentally impossible for data to be subsequently changed, which is why it is also referred to as a kind of "digital notary". Numerous use cases also arise in the area of taxation - particularly in the context of transaction-intensive types of tax. For this purpose, blockchain technology offers the ideal conditions for the use of so-called smart contracts (self-executing contracts), which can be used for tax purposes along the entire transaction chain of a blockchain.

There is a very potential for blockchain technology in the field of taxation, because Blockchain functions as a decentralized and immutable database that maintains a transparent record of transactions across a network of computers. Each transaction or life issue is represented by a block, and these blocks are cryptographically linked, ensuring that the data stored on the blockchain cannot be easily altered or tampered with.

The inherent characteristics of blockchain make it a promising tool for various taxation use cases, particularly in transaction-intensive tax areas. Here are a few examples:

a. ***Transparent and Traceable Transactions***: Blockchain can provide a transparent and auditable record of transactions, enabling tax authorities to verify the accuracy of reported transactions. This can help reduce tax fraud and evasion.

b. ***Smart Contracts for Tax Automation***: Smart contracts are self-executing agreements written in code that automatically execute predefined actions when specified conditions are met. In the context of taxation, smart contracts can be used to automate tax calculations, payments, and compliance. For instance, VAT or sales tax can be automatically calculated and transferred to the relevant tax authorities when a transaction occurs on the blockchain.

c. ***Enhanced Tax Compliance***: Blockchain's immutability and transparency can facilitate enhanced tax compliance. By recording transactions on a blockchain, tax authorities can have real-time visibility into economic activities, simplifying the process of verifying income, expenses, and tax liabilities.

d. ***Supply Chain and Customs Duties***: Blockchain can be utilized to track and verify the origin and movement of goods in supply chains. This can aid in ensuring compliance with customs duties and excise taxes, reducing smuggling and illicit trade.

e. ***Tokenization of Assets***: Blockchain enables the tokenization of assets, representing them as digital tokens on the blockchain. This can have implications for tax purposes, such as capital gains tax on the sale or transfer of digital assets.

However, it's important to note that while blockchain has significant potential, there are also challenges to consider. These include scalability, privacy concerns, regulatory frameworks, interoperability, and the integration of blockchain with existing tax systems. As the technology continues to evolve and regulatory frameworks adapt, we can expect to see further exploration and implementation of blockchain in taxation, leveraging its benefits for transparency, efficiency, and automation.

8.4.1. Generic fields of application:

a. Digital infrastructure between companies and with the public administration for the digital storage and exchange of tax data
b. Universal (tax) identity
c. Fraud identification to secure the tax revenue
d. Unalterable ("forgery-proof") documentation
e. Securing and verification of original tax documents

8.4.2. Concrete use cases:

a. Value added tax:
- Documentary evidence for tax exemption of intra-Community supplies (also in the case of series transactions).
- Documentation of deliveries to / from a consignment warehouse.
- VAT / input tax mapping, validation of VAT ID numbers.

b. Customs
- Long-term supplier declaration, proof of delivery, documentation of flow of goods.

c. Transfer pricing:
- Transfer pricing documentation, documentation of intercompany transactions.
- Mapping of transfer prices via smart contracts (self-executing contracts).

d. Capital gains tax:
- Avoidance of double refund by the tax authorities.

e. Withholding tax:
- Documentation of withholding tax.

8.5. Robotics Process Automation – RPA

Maturity for tax use: 90%
Relevance for tax use: 70%

Robotic Process Automation, or "RPA" for short, describes the automated processing of structured repetitive activities by "software robots". The use of RPA ultimately enables the automated processing of standard procedures. Bots independently access systems or data and independently perform selected transactions. In doing so, the bots act in a manner comparable to humans (one could also say that humans are imitated) by automating user input and using existing user interfaces in the form of keyboard or mouse input. Accordingly, this technology lends itself to taking over repetitive manual tasks ("click work") in the control area, especially when data needs to be transferred between different systems.

RPA refers to the use of software robots or bots to automate repetitive, rule-based tasks that are typically performed by humans. These bots interact with various software systems and applications, mimicking human actions such as data entry, mouse clicks, and keyboard inputs.

RPA technology allows organizations to streamline their business processes, reduce human error, improve efficiency, and free up employees' time for more value-added work.

RPA bots can access systems, retrieve and manipulate data, perform calculations, and execute predefined tasks. They can work across multiple systems, bridging the gap between different applications and databases, and facilitate the transfer of information between them. By automating these routine tasks, RPA helps organizations improve accuracy, speed, and consistency while reducing costs and increasing productivity.

RPA is often employed in areas where there are repetitive and rule-based tasks, such as data entry, data validation, report generation, invoice processing, customer onboarding, and more. It can be particularly beneficial when there is a need for data exchange between different systems that do not have direct integration capabilities.

Overall, RPA is a technology that enables organizations to automate manual and repetitive tasks, allowing employees to focus on more strategic and complex activities.

8.5.1. Generic fields of application:

- Taking over repetitive tasks.
- Processing of standard procedures.
- Filling out forms.
- Evaluation of data.

8.5.2. Concrete use cases:

- Preparation of the advance VAT return and the Intrastat return.
- Compilation of payroll data (aggregation of information from different systems such as human resources, time recording, etc.)
- Invoice verification (especially in combination with => OCR – Optical Character Recognition).
- Reading out information from tax assessment notices (if necessary, in combination with => OCR – Optical Character Recognition).
- Checking travel expenses.
- Initiating bookings (if necessary, in combination with => AI – Artificial Intelligence).
- Data preparation for subsequent analysis tools or BI solutions (=> BI – Business Intelligence).
- Tax reporting support, especially (pre-)aggregation of information.

8.6. Chatbot

Maturity for tax use: 80%
Relevance for tax use: 70%

A chatbot is a technical dialog system that enables dialog between humans and machines. The "conversation" takes place via text input or natural language (also "voicebot"). The user can ask questions, which the bot answers accordingly. Technically, a distinction can be made between two types: Rule-based or AI-based. While chatbots with artificial intelligence learn from existing dialogs, rule-based chatbots draw on a catalogue of predefined questions and answers. For the tax sector, numerous possible applications are opening up, particularly in the form of "digital assistance systems".

In terms of technical classification, there are primarily two types of chatbots: rule-based and AI-based. Rule-based chatbots rely on predefined sets of rules, questions, and corresponding answers. These chatbots follow specific decision trees or logic flows to generate responses.

On the other hand, AI-based chatbots leverage artificial intelligence techniques, such as machine learning and natural language processing (NLP). These chatbots learn from existing conversations or data and can generate responses based on patterns and contextual understanding. They can adapt and improve their performance over time through continuous learning.

In the tax sector, there are numerous potential applications for chatbots, particularly in the form of digital assistance systems. These chatbots can assist users with tax-related inquiries, provide information on tax regulations, help with tax calculations, or guide users through tax filing processes. By automating certain tasks and providing accurate information, chatbots can enhance efficiency and convenience in the tax domain.

8.6.1. Generic fields of application:

a. Answering recurring (standard) questions.
b. Structuring queries and Avoiding errors.

8.6.2. Concrete use cases:

a. Digital assistance systems for sales tax or payroll tax issues, by way of example:
   - Invoicing obligations in different member states.
   - Series transactions/triangular transactions for VAT purposes.
   - Treatment of incentives.

- Taxation of e-mobility.
- Capitalization/depreciation of software.

b. Support for tax determination (if necessary, in combination with => AI – Artificial Intelligence & => NLP – Natural Language Processing)
c. Structuring of tax-related queries by automated assignment of queries to specific topics / employee groups etc.
d. Support in the operation of tax applications (integration in the respective interface) e.g. help with errors (if necessary, in combination with => RPA – Robotics Process Automation).

8.7. Process Mining

Maturity for tax use: 90%
Relevance for tax use: 100%

Process Mining stands for software solutions that are used to analyze and visualize existing data flows within an organization's processes. Based on these existing data flows, processes can be traced ("digital walkthrough") and anomalies can be identified. By tracing these processes digitally, process mining can help identify anomalies and deviations from predefined target process flows or "happy paths" and thus improve the actual situation in a targeted manner. Process mining is also seen as a connecting technology between data mining and process management. Especially in view of the increasing complexity of tax-relevant processes, process mining is becoming more and more important in the tax area.

It provides valuable insights into how processes are actually being executed, allowing organizations to compare the observed processes with the ideal or desired ones. This comparison helps identify areas for improvement and optimization in order to bring the actual situation closer to the target process flows. By pinpointing inefficiencies, bottlenecks, or compliance issues, process mining enables organizations to make data-driven decisions and take targeted actions to enhance their processes.

In the tax area, where processes can be complex and subject to strict regulations, process mining plays an increasingly important role. It allows tax professionals to gain a deeper understanding of tax-relevant processes, detect potential compliance issues, and identify opportunities for streamlining and automation. By applying process mining techniques, tax professionals can optimize tax processes, ensure compliance with tax regulations, and improve overall efficiency.

Process mining can be considered a connecting technology between data mining and process management. It leverages the wealth of data available within an organization and applies data mining techniques to extract valuable insights about process execution. These insights can then be used to enhance business process management strategies, align processes with business goals, and drive continuous improvement.

Overall, process mining offers a powerful set of tools and techniques for analysing, visualizing, and improving business processes, including those in the tax domain. Its ability to provide a comprehensive view of process execution based on real data makes it an increasingly important technology for organizations aiming to optimize their operations and achieve better outcomes.

8.7.1. Generic fields of application:

a. Virtual process walkthrough.
b. Uncovering of process deficits and improvement potential.
c. Identification of target/actual deviations in control-relevant processes.
d. Modelling and definition of executable business processes.

8.7.2. Concrete use cases:

a. VAT / Sales tax:
   - Validation of the overall tax document flow, including tax determination.
   - Validation of the accounting system.
   - Preparation of real-time / near real-time reporting requirements.

b. Tax CMS:
   - Validation of target processes incl. specified controls.
   - Recognition of errors / inefficient processes.

c. Tax processes in general:
   - Increasing the efficiency of tax processes.
   - Evaluation of automation potentials in processes and analysis.

8.8. Cloud Computing

Maturity for tax use: 100%
Relevance for tax use: 100%

Cloud computing describes a model that provides shared computer resources as a service, for example in the form of servers, data storage or applications, on demand (usually via the Internet and device-independently) in real time and with little effort. The advantage of cloud applications lies primarily in the scalability of storage capacities and computing power, with three basic typologies to be distinguished: Software as a Service (SaaS) allows the user to use a program directly via the Internet and is also becoming increasingly important in the environment of tax solutions. With Platform as a Service (PaaS), the service provider provides fully managed environments, for example in the form of portal solutions. Finally, Infrastructure as a Service (IaaS) is a further expansion stage that gives users even more direct access to IT resources.

Cloud computing can be effectively used in tax administration. The various models of cloud computing, such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS), offer different levels of flexibility and control for users. SaaS enables users to access tax applications directly through the internet, without the need for local installations. This model is becoming increasingly important in the tax solutions environment, as it allows users to utilize tax software without having to manage the underlying infrastructure.

PaaS provides fully managed environments, including portal solutions, which can be customized to meet the specific needs of tax administration. This allows tax authorities to develop and deploy their own applications and services on a cloud platform, without having to worry about the infrastructure management. IaaS offers users direct access to IT resources, allowing tax administrations to have more control over their computing infrastructure. With IaaS, tax authorities can provision and manage virtual machines, storage, and networks in the cloud, providing scalability and flexibility as needed.

However, as previously mentioned, data security and data privacy are crucial considerations when adopting cloud computing in tax administration. Tax authorities deal with sensitive financial and personal information, and it's important to ensure that this data is properly protected. When implementing cloud solutions, tax administrations should consider the following:

a. ***Data encryption***: Implement strong encryption methods to protect data both in transit and at rest. Encryption helps safeguard sensitive information from unauthorized access.

b. ***Access controls***: Implement strict access controls to ensure that only authorized personnel can access tax data. Use multi-factor authentication, role-based access controls, and strong password policies.

c. ***Compliance and certifications***: Choose cloud service providers that comply with relevant data protection regulations and have industry-recognized certifications (e.g., ISO 27001). Verify that the provider has adequate security measures in place.

d. ***Data segregation***: Ensure that tax data is stored separately from other customers' data to maintain confidentiality and prevent unauthorized access.

e. ***Regular audits and monitoring***: Conduct regular security audits and monitoring to identify and address any potential vulnerabilities or security incidents promptly.

f. ***Service level agreements (SLAs)***: Establish clear SLAs with the cloud service provider to ensure the availability, performance, and reliability of the tax applications and data.

By implementing appropriate security measures and selecting trustworthy cloud service providers, tax administrations can mitigate the risks associated with data security and data privacy while leveraging the benefits of cloud computing in tax administration.

8.8.1. Generic fields of application:

a. Shared use of applications or IT infrastructure
b. Scalable demand for computing power and storage space
c. Location and device-independent use of computing resources

8.8.2. Concrete use cases:

a. File-share for data exchange between client and consultant
b. Data rooms for data exchange with the tax authorities
c. Collaboration solutions ("client portals") between client and advisor, with the aim of mapping the entire declaration process largely without media discontinuity.
d. Use of web based TaxTech solutions as SaaS solutions[1]
e. Provision of Tax Apps ("smart" solutions for selected tax issues)
f. Use of complete tax engines, primarily in the area of sales tax via the cloud.

[1] This refers to technological solutions for tax related issues through applications on the internet without the need for local installation of the applications.

8.9. Business Intelligence – BI

Maturity for tax use: 100%
Relevance for tax use: 100%

Business Intelligence refers to the technologies, applications, and practices used to collect, analyse, and present data in a way that provides valuable insights for business decision-making. BI solutions are designed to gather data from various internal and external sources, process it, and transform it into meaningful information that can be used by managers and other stakeholders. The insights gained from this are intended to support managers in particular in making well-founded business decisions. Corresponding software solutions are used to collect data from internal and external sources, analyse it and visualize it using customized reports or so-called key performance indicators ("KPIs") or dashboards. In the tax context, BI solutions are primarily used in the area of mass transactions and thus in the context of sales tax, transfer prices or payroll tax.

In the tax context, BI solutions can be particularly useful in dealing with mass transactions and managing tax-related processes. Here are a few examples of how BI can be applied in the tax field:

a. ***Sales Tax***: BI tools can be used to collect transactional data from sales systems and analyse it to identify patterns, trends, and anomalies. This can help in monitoring sales tax compliance, detecting potential errors or fraud, and optimizing tax planning strategies.

b. ***Transfer Pricing***: BI solutions can assist in analysing and comparing transaction data between related entities to ensure compliance with transfer pricing regulations. By providing visualizations and reports, BI tools enable tax professionals to monitor intercompany transactions, identify transfer pricing risks, and support transfer pricing documentation requirements.

c. ***Payroll Tax***: BI can be employed to consolidate and analyse payroll data, enabling tax professionals to ensure accurate payroll tax calculations and compliance. By integrating data from various HR and payroll systems, BI tools can provide insights into payroll tax expenses, employee benefits, and compliance with tax regulations.

By utilizing BI solutions in the tax context, organizations can streamline their tax processes, identify risks and opportunities, and make informed decisions to optimize their tax positions. These tools enable tax professionals to efficiently analyse large volumes of data, generate

reports, and visualize key performance indicators (KPIs) or dashboards that provide a comprehensive overview of tax-related information.

8.9.1. Generic fields of application:

a. Analysis of mass tax data
b. Detection of anomalies and trends
c. Visualization of data according to pre-defined specifications
d. Independent of ERP or source system

8.9.2. Concrete use cases:

a. VAT / Sales tax:

- Recognition of deviations in incoming and outgoing services
- Recognition of deviations in intra-Community supplies/exports
- Recognition of deviations in intra-Community acquisitions/imports
- Recognition of differences in intra-group series transactions/triangular transactions
- Recognition of differences in the use of master data in tax determination

b. Wage tax:

- Recognizing differences in the use of master data for wage taxation purposes

c. Customs:

- Detection of different tariffing

d. Transfer pricing:

- Detection of violations of transfer pricing guidelines

e. Tax Compliance Management Systems (Tax CMS):

- Detective controls to identify risk cases

f. Performance measurement:

- Presentation of metrics / KPI's of activities for which the tax function is responsible

8.10. ETL – Extract, Transform, Load

Maturity for tax use: 90%
Relevance for tax use: 70%

ETL stands for Extract, Transform and Load. Using appropriate software solutions, data from several, sometimes heterogeneous, structured data sources are combined in a target database, also known as a "data lake" or "data warehouse". ETL aims in particular to keep information at a central location ("single point of information") and to minimize latency times. ETL is thus often also an essential building block for the use of BI solutions or a holistic Tax CMS.

ETL processes are commonly used in various contexts, including tax data management. In the tax domain, ETL plays a crucial role in consolidating and integrating data from diverse sources, such as financial systems, ERP (Enterprise Resource Planning) systems, CRM (Customer Relationship Management) systems, spreadsheets, and other data repositories.

The ETL process involves the following steps:

- Extraction: Data is extracted from multiple sources, which could be structured databases, flat files, or APIs. In the tax context, these sources may include transactional data, financial records, customer information, purchase orders, and more.

- Transformation: Extracted data often requires cleaning, standardization, and enrichment before it can be effectively used for tax purposes. This step involves applying business rules, data validation, data cleansing, data formatting, and performing calculations or aggregations as necessary. Transformations may also involve harmonizing data formats and units of measure to ensure consistency across different source systems.

- Loading: The transformed data is loaded into a target database, which could be a data lake or data warehouse. This central repository acts as a single point of information for tax-related data. The loading process may involve creating data models, defining data schemas, mapping data fields, and structuring the data in a way that facilitates reporting and analysis.

By implementing ETL processes in the tax context, organizations can achieve several benefits:

- Centralization: ETL enables the consolidation of data from various sources into a central repository, promoting a single point of information. This centralization helps ensure data accuracy, consistency, and integrity.
- Data Quality: The transformation phase of ETL allows for data cleansing, validation, and enrichment, improving the quality and reliability of tax-related data. This ensures that tax calculations and reporting are based on accurate and trustworthy information.
- Efficiency: ETL minimizes latency times by automating the extraction, transformation, and loading of data. This reduces manual effort and allows for timely access to up-to-date tax data, which is crucial for compliance, reporting, and decision-making processes.
- Business Intelligence: ETL is often a foundational step for implementing Business Intelligence (BI) solutions in the tax domain. By integrating data from different sources, ETL enables tax professionals to gain insights, perform analysis, and generate meaningful reports for tax planning, risk management, and compliance purposes.
- Tax CMS (Compliance Management System): ETL processes are integral to building a holistic Tax CMS. By extracting and consolidating data from various systems, ETL facilitates the implementation of tax compliance workflows, monitoring tax liabilities, and ensuring adherence to regulatory requirements.

In summary, ETL plays a vital role in the tax context, enabling organizations to combine data from multiple sources, maintain a central repository, and leverage the data for business intelligence, compliance, and tax management purposes.

8.10.1. Generic fields of application:

a. Consolidation of heterogeneous data sources.
b. Central provision of fiscal data for further applications and processes.

8.10.2. Concrete use cases:

a. Establishment of a tax data warehouse or a tax data lake.
b. Creating a harmonized tax data basis.
c. Preparation of data for further tax analysis using data analysis tools, special BI tools (=> BI – Business Intelligence) or process mining applications (=> Process Mining).
d. Preparation of tax reporting.
e. Preparation of data for tax declaration.
f. Tax planning and scenario modelling.

8.11. Optical Character Recognition - OCR

Maturity for tax use: 100%
Relevance for tax use: 70%

OCR describes the use of technology or corresponding software solutions to recognize unstructured information in the form of printed or handwritten text characters. OCR - also known as text recognition - is used to recognize and convert printed or handwritten text characters into machine-readable text. It plays a significant role in various fields, including taxation. In the context of the use of AI or RPA, OCR is also frequently used as a subcomponent to extract or prepare unstructured data for further use.

From a tax perspective, OCR is used in particular in the area of reading tax assessments, at least until assessments are transmitted electronically in structured form in the future. It can be used to extract information from tax assessments, invoices, receipts, and other tax-related documents. By using OCR technology, these documents can be scanned or photographed, and the text within them can be automatically recognized and extracted.

It enables the conversion of unstructured data, such as text within documents, into structured information that can be easily processed and analysed. This structured information can be further utilized by artificial intelligence (AI) or Robotic Process Automation (RPA) systems for various purposes, such as data entry, analysis, or integration with other systems.

While electronic transmission of tax assessments in structured form may become more prevalent in the future, OCR can still be valuable for converting existing paper-based or non-structured documents into machine-readable text. It helps streamline processes, improve accuracy, and reduce manual data entry efforts in tax-related tasks.

Overall, OCR plays a crucial role in digitizing and automating tax processes, enabling more efficient management and analysis of tax-related information.

8.11.1. Generic fields of application:

a. Interpretation of text.
b. Translation of unstructured data into structured data.
c. Data preparation for further solutions in the field of AI or RPA.

8.11.2. Concrete use cases:

a. Readout of invoices or document data.
b. Support of invoice receipt verification by means of the so-called "two-way-match (invoice vs. purchase order) or "Three-Way-Match" (invoice vs. purchase order vs. goods receipt).
c. Automatic assignment of travel expense receipts to travel expense reports.
d. Pre-assignment of receipts (if necessary, in combination with => RPA – Robotics Process Automation).
e. Readout of tax assessments.

8.12. Low Code / No Code

Maturity for tax use: 60%
Relevance for tax use: 90%

Low Code and No Code solutions are software development tools or platforms that allow users to create applications or solutions without the need for traditional programming languages. These solutions utilize a graphical user interface where users can drag and drop function modules to build applications or workflows. The underlying coding is abstracted, and the platform takes care of executing the code in the background. In contrast to No Code solutions, Low Code solutions still require a certain amount of classical programming effort. Low code environments are also primarily used to add missing functions at a later stage. No code solutions also offer employees without programming knowledge the opportunity to create individual solutions, which can be particularly attractive for the tax department.

In a tax context, Low Code and No Code solutions can be beneficial for several reasons. Firstly, they provide a way for individuals without extensive programming knowledge or skills to create custom solutions. This can be particularly useful for the tax department, where employees may have domain expertise but limited coding experience. These solutions allow tax professionals to automate repetitive tasks, streamline processes, and build custom applications specific to their tax-related needs. For example, they could create workflows for tax return preparation, automate data entry and validation, generate reports and analytics, or integrate with other tax-related systems.

Low Code solutions, although requiring some programming effort, offer more flexibility and customization options compared to No Code solutions. They allow for the addition of missing functions, or the integration of complex business logic as required. On the other hand, No Code solutions are typically more user-friendly and accessible, as they require minimal or no coding skills at all. Overall, Low Code and No Code solutions can empower tax professionals to be

more self-sufficient in creating and managing their own software solutions, reducing the reliance on traditional software development cycles and enabling faster innovation and iteration in the tax department.

8.12.1. Generic fields of application:

a. Software development without programming knowledge.
b. Coding in the background.

8.12.2. Concrete use cases:

a. Creation of expert tax systems in the form of decision trees, for example in the area of VAT.
b. Creation of workflows for tax departments to collect recurring information from subsidiaries or from other departments.
c. Creation of chatbots for recurring tax questions ("Tax Self Service").
d. Use of predefined building blocks "for digitizing work steps in the tax environment for which standard software is not (yet) available.

In conclusion, the utilization of new technologies presents an opportunity to revolutionize tax administration systems worldwide. Through the integration of the advanced tools discussed here such as artificial intelligence, blockchain, and data analytics, tax authorities can enhance efficiency, accuracy, and compliance while minimizing costs and resource burdens. The adoption of these technologies not only streamlines administrative processes but also fosters transparency, accountability, and trust between taxpayers and government agencies. However, it is imperative for policymakers and tax administrators to address potential challenges such as data privacy concerns, cybersecurity risks, and equitable access to technology. By navigating these obstacles with foresight and collaboration, the potential benefits of modernizing tax administration through new technologies can be fully realized, leading to a more effective and equitable tax system and supporting Domestic Revenue Mobilization efforts.