

Agentic Tax Intelligence: Designing Autonomous AI Advisors for Real-Time Tax Consulting and Compliance

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Abstract

Real-time tax consulting has not been widely supported by digital technology so far. This is not because of the lack of digital tools for tax consulting but despite the amazing richness of the tax law and the supporting documentation and the huge, ongoing data-producing activities necessary for the application of knowledge and audit practices. A change of relevant professional expertise is needed, both to set and to follow new goals and directions for the digitalization of tax consulting. Taxes represent one aspect of the countless geographic variations of human communities. The importance of learning and abiding by them to conduct economic activities that are sustainable and gain approval from society is another common aspect. Specific knowledge, known as tax expertise, is necessary to provide appropriate activities, namely tax advice, tax compliance, and tax compliance auditing. Such activities can be supported by numerous digital tools available at present.

AI extends the effective, active knowledge access and use of people, here of tax professionals. The addition of autonomous traits to an AI-based digital tool enlarges the tax expert's or digital tax advisor's genuine professional expertise. This would form a novelty for further supplementing and fine-tuning the common practice of tax professionals in tax advice, tax compliance, and tax compliance auditing. Materials, information benefits, and timing performance of a digital tax advisor/shared knowledge expert will soon surpass and predominate the related and tax-defined performance of a traditional tax professional. Designing such an autonomous intelligent digital advisor or intelligent expert is an enormous multiprofessional task, to be set up and performed by lawyers, mathematicians, computer scientists, economists, pedagogues, accountants, and auditors. Yet, only an AI that is itself the result of a division of cognitive labor of this kind, that is, a digital AI that is endowed with sufficient shared professional knowledge, can and will in turn become the missing link that can keep a tax professional's balance of knowledge up to date. Indeed, such an AI advisor will then do the tax law application follow-up and tax audit by providing visual and auditory evidence directly.

Keywords: AI, Tax Consulting, Digitalization, Tax Law, Audit Practices, Professional Expertise, Knowledge Access, Autonomous AI, Digital Tax Advisor, Tax Compliance, Tax Auditing, Cognitive Labor, Shared Knowledge, AI-Based Tax Tools, Economic Sustainability, Machine Learning, Legal Technology, Expert Systems, Real-Time Consulting, Intelligent Automation, Regulatory Compliance.

1. Introduction

Despite the advances in legal knowledge and problem-solving capabilities, most tools in tax law provide the equivalent of digital atlases or the search results of an enhanced search engine for cases and statutes. In each case, search results and vague overviews of provisions are produced. Search engines enable legal advisors to swiftly collect information from the law and to locate the relevant provisions for a given case, thereby decreasing the cost of access due to the search and the opportunity cost of further investigation. However, the cost of verifying the credibility, sufficiency, and significance of the information recovered remains non-negligible. Legal advisors must verify if the search results or law overviews are related to their question, reliable, accurate, comprehensive, and up-to-date. Legal advisors must also analyze and synthesize the information correctly for their purposes and features. Indeed, the lawyer's unique soft skills, the safety of their clients, and the quality of their work greatly depend on these activities.

Concepts, methodologies, tools, and techniques from computer science or artificial intelligence are increasingly used in both legal education and legal practice. For example, managing labor activities through legal operating systems is a point of interest. In particular, AI-based tools have been developed to assist legal advisors with certain tasks such as drafting, predicting the outcome of a case, or finding case law relevant to the issues or related to their prediction. At the same time, AI and AI-based tools have a growing role in the tax field. On the one hand, AI tax tools mostly rely on techniques and knowledge from economics and statistics. For example, certain AI-driven tax applications optimize the capital structures, legal forms, or business models of companies based on taxation. In contrast to these tools, proactive and real-time tax intelligence assesses the legal problems or the relative uncertainty of a business or investment operation from a tax point of view, taking into account the business situations and tracking the relevant legal rules in real-time.

1.1. Overview of Tax Consulting Innovations

Technological changes often trigger economic adjustments and adaptations. Recent advances have mainly expanded the capacity to complete traditional tax activities rather than liberating tax consulting professionals from the need to perform these activities. Tax technology innovation that improves tax compliance has not translated into autonomy that significantly alters tax planning and consulting. 'New' tax advisors launched over the last five to ten years include those specializing in economic substance, permanent establishment, country-by-country, hybrid, and international NGO tax planning.

Although the terminology may cause initial confusion, various factors differentiate new tax advising providers. Digitally native services use digital tools designed to take advantage of technological features and efficiencies, lowered costs, and enhanced user experiences. Digitally enabled services utilize digital tools to improve access to, and timely applications of, professional tax consulting services. Automated consulting services use digital tools to solve particular tax problems or within a particular tax scope instead of a traditional human-gathered methodology. Digitally native tax advisors possess all these features, though digitally enabled and automated tax advisor categories require discrete tax-specific digitalization characteristics.

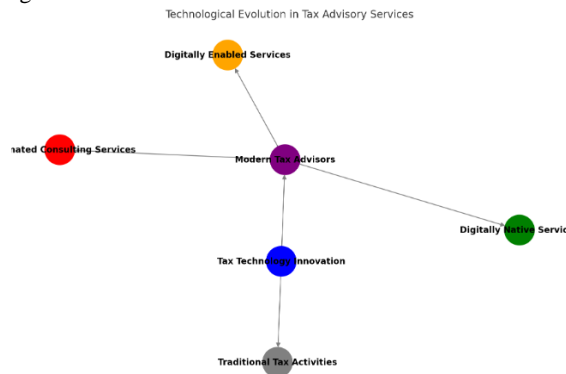


Fig 1 : Technological Evolution in Tax Advisory Services

1.2. Trends Shaping the Future of Tax Consulting

The intensification of tax-related issues and the expanding complexity of tax risk situations require firmer bonds between tax authorities and taxpayers, optimized by intelligent data-driven tax consulting. Tax authorities rely on a variant of the strange loop effect to optimize control by simulating the resolution of complex tax consulting problems in extensive tax rulings that, in their subsequent enforcement activities, serve as role models in similar tax risk situations. It is critical to recognize, based on a strategic approach to tax consulting services, that AI technology provides real-time fiscal problem-solving skills

to self-regulate taxpayer behavior successfully in simulating tax consulting with their tax authorities on an equal footing, controlling tax processes and thus enabling worldwide taxation to transform from audit-based to file-based.

2. Contextual Overview

I present a new vision and approach to research on AI advisors, which we call autonomous advisor (AA) systems, defined as adaptable and self-governed AI advisors that can perform tasks normally requiring human-level intelligence across a wide spectrum of domains in real-world, dynamic environments. As a way of modeling such systems in pre-deployed settings, our vision emphasizes the recursive design of a control regime that fosters the AI's tax functionality over time, especially in the design phase – the AI's mastering of its craft via experience exposure – while addressing the normal fixation on the capabilities and behaviors of such systems during deployment. For human subjects in the audit study, with public interactions enabled, AA systems retain superior performance in terms of tax advice quality and time efficiency as compared to standard control systems, while also eliciting more interaction with users. These AI systems, deployed at a massive scale, can help to effectively address long-standing problems in the tax domain.

AA technologies are arising from the confluence of several converging trends. The advent of digital and cognitive technologies enables varying degrees of digitization of a task's form, content, context, process, and product. With wide applicability across diverse knowledge-intensive domains such as tax, audit, law, medicine, and architecture, this rapidly evolving class of technologies streams large amounts of data in real-time, helping AAs generate contextual knowledge during consultations. Recent advancements in AI and machine learning help AAs improve their knowledge and task expertise. High-performance computing and storage infrastructure facilitate system development and continuous performance improvement, now archived via cloud technologies at minimal real-time cost. These forces reinforce one another – as more data are collected, technical advances in AI and machine learning change how we learn from these data, which in turn creates additional data that propels further technical advances.

2.1. Historical Insights into Tax Consulting

In the first half of the 1800s, Asa Ale Hardenbourg's Real Estate Ledger, arranged in the order of the United States Census of 1840, distributed the addresses of names, income tax paid, officially printed, assessed, and published value of real estate owned by federal income tax-paying citizens in all counties of the United States. After some 80 years of

compliance, it was concluded in research that tax consulting has enabled compliance by instilling good faith in sophisticated taxpayers who consider visiting tax consultants for advice on their substantive tax positions. Tax gap estimates typically provide detailed statistics on an annual basis for the historical and explanatory analysis of tax consulting. These are based on complex samples because most tax returns are deemed confidential tax return information, precluding access by academic researchers, tax advisers, tax agencies, and policymakers for the population used to make gap estimates. The dependent variable for defining the tax gap and reporting a tax consulting use coefficient in a technical model equals the amount of the gap for the metric under investigation. Both dependent explanatory variables provide research methods in the economics literature and structurally define accounting phenomena.

Included is the employment of other experts about the boundary between tax compliance and tax non-compliance, including often highly qualified, underemployed, and disenfranchised tax experts who are among the missing millions of self-assisting taxpayers in the tax system. Unlike those new to extending consulting from traditional milestones such as audit, filing, and payment due dates, a new standard in the 21st century, search, caring, and verification technologies has recently emerged. Statistical knowledge and discretion gleaned from experience with the information data and knowledge in extant and evolving tax systems are combined to exploit European economies' unreported income shadow resources: usage, avoidance, and evasion. Internet-based income tax services created opportunities to perform timely spot consulting for new concerns included on the list of over 400 key Canadian federal corporate statutes, plus law regroups. The wealthy United States, the United Kingdom, and Canada commercialized this late tax consulting earnings cycle, extending tax seasons for at least one quarter of the year by providing telephone tax advice during the tax season.

Equation 1 : Real-Time Tax Liability Calculation

$$T = \sum (I_i \cdot r_i) - C$$

T = Total tax liability,

I_i = Taxable income component,

r_i = Applicable tax rate,

C = Eligible credits/deductions.

2.2. Progression of AI in Financial Services

The term artificial intelligence was first used in 1956 to design algorithms for machines to mimic human cognitive functions. In the 1960s, manufacturers began to automate many industrial procedures by embedding them in machinery. Subsequently, application software was adopted

in the 1970s, allowing professionals to use computers to manage increasingly large, complex systems. The nature of AI is characterized by the ability to learn, reason, plan, and solve complex problems; the ability to understand and interact with the physical world, and the ability to respond meaningfully to frequent and changing information in real time.

Mathematical algorithms that process data are now capable of rapidly identifying differences between economic simulations and how we experience effects in the real world. This concept of practical AI once seemed to be decades away from practical implementation, until, for example, credit scoring was augmented by deep learning. Online lenders began to provide consumers with credit decisions in a fraction of the time traditional banks were able to perform the same work while offloading these processes from their human staff. A natural next step in this practice was to further refine algorithms to assess individual risk by using available alternative data. As a result, many of these businesses could use unique and constantly updating data to make faster, fairer assessments of a credit request. Similarly, the provision of financial advice, including legal and tax compliance, was significantly accelerated by applying AI and blockchain. Companies are increasingly employing relevance-determined fractional logic and fuzzy set-based AI to shape an AI advisor capable of virtually instantaneous intelligence. They are using such algorithms to create specialized supervised and semi-supervised machine learning models.

3. Conceptual Framework

Tax intelligence is the use of technology to improve tax management. This paper extends this to an agentic concept, noting that technology can increase autonomy, allowing people to enjoy a hands-off relationship with it. Agentic tax intelligence involves bi-directional conversations with AI about tax-specific information needs regarding current financial positions and suggested next steps. An agentic framework was developed and discussed. To demonstrate this is neither utopian nor theoretical, prototype AI assistants using state-of-the-art AI technology available in a tax context are presented. The after-presentation discussion focuses on future tax design needs.

The relationship between computer science offering AI services and tax is modern. This paper capitalizes on the relatively recent trend of tax departments adopting AI services to improve tax intelligence and its relationship with their professional advisors, moving past static task-automation AI tax services. Instead, focus is given to state-of-the-art, real-time AI services that not only provide tax intelligence but are also designed to facilitate a new agentic relationship between state-of-the-art computer AI advisors

and tax decision-makers. The term 'Agentic Tax Intelligence' will be used when referencing our AI services. Enhancements to traditional tax intelligence response systems and processes that are needed to optimize the benefits AI offers its users are considered and discussed.

Agentic Tax Intelligence Framework

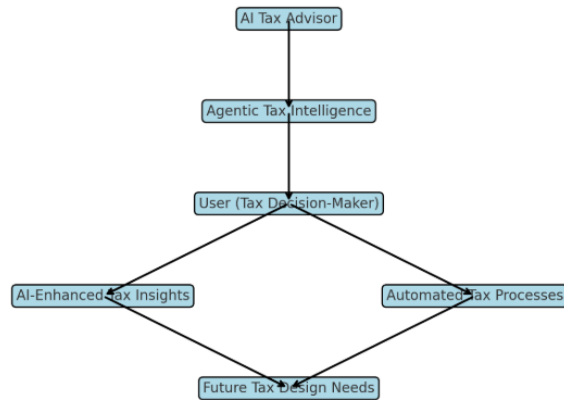


Fig 2 : Agentic Tax Intelligence Framework

3.1. Defining Agentic Tax Intelligence

Agentic intelligence can be characterized as the capacity for flexible and cognitively flexible lifelong learning in autonomous problem-solving. Three key elements differentiate modern, technology-based artificial agentic intelligence from early concepts of expert systems. First, adaptive self-improvement uses tools and distributed resources to develop new networks and connections for rapid learning and response. Second, organized client commitment, with continuing contact and voluntary reporting of errors and exceptions, creates high-quality feedback and helpful human development throughout the AI system's operation. Third, lasting machine privacy and control help users manage sensitive personal and business secrets. The second modification of agentic tax intelligence is that such systems are autonomous, or primarily self-acting. To adapt and improve their knowledge and algorithms, they can select and manipulate data and individuals, always subject to privacy and nondiscrimination constraints. They can act as independent responsible advisers for their clients, aware of the possible legal need to fulfill sensitive requests, and acting always in the legal interests of their clients.

To serve its clients as a caring tax advocate, agentic tax intelligence is a hybrid system. It understands that in tax law, individual circumstances, past filing and payment history, and human feelings play an essential role. It starts with the competencies of today's best AI tax agents in handling data and the explicit resolution of cognitively complex and high-stress tax compliance problems. In deciding how to pursue the exchange of possibly private and secret client information, it integrates necessary final

guidance from human experts. The resulting systems, adapted to the real needs and concerns of developing countries, can produce timely, reliable, high-quality tax services for everyone while reassuring them and maintaining client privacy.

3.2. Components of Autonomous AI Advisors

Tax rules differ among taxing authorities in the same jurisdiction and vary substantially in different jurisdictions. The number of different factors and relationships that tax authorities can consider for tax compliance grows exponentially. This increased complexity represents a challenge for maintaining a high level of tax compliance with a low tax compliance cost. Agentic Tax Intelligence technologies can alleviate the added complexity without losing compliance. They propose the design and implementation of autonomous artificial intelligence (AI) advisors for immediate income tax return services by focusing on operations design with a funnel-like approach to tax-derived data, expanding the scope of the continuous interaction digital information collection technology for real-time information reporting, and maximizing the leveraged benefits of cognitive computing for tax consulting and compliance.

The continuous evaluation of ever-urgent taxpayers' needs that autonomous AI advisors provide aims to save taxpayers' time and facilitate decision-making when it comes to tax consulting or compliance. This streamlining of the process will contribute to improved tax compliance and tax compliance costs. The systems approach results are illustrated with real-life continuous improvement continuous interaction digital information collection technology in use case results for "year-round" taxpayer digital data feeding, which displays the annual tax revenue cost-effectiveness of the consultancy services. However, this comprehensive non-invasive design approach has to be further expanded with applications for the development of reporting-readiness digital data analysis and response-elicitation-driven continued assistance.

4. Design Principles

Designing autonomous advisors that can engage in real-time tax consulting involves profound design principles and decisions. As opposed to classical thinking on designing tax systems to 'maximize' tax revenues, we propose a novel design perspective with the aim of 'minimizing' the cost of tax compliance by facilitating instantaneous and flawless resource utilization in technical tax compliance procedures. The service model to be employed systematically needs to consider information modeling for accurately representing a tax situation with all parameters.

We need to embed a collision avoidance mechanism to avoid taxpayer-AI-intelligent agent collisions. After all,

lower regulator-intelligent agent encounters and increased co-enforcement are desirable, but not at the expense of sacrificing tax compliance quality. The quality of tax decisions is important both for taxpayers and society. We need to be creative and ambitious in modeling the social cost of poor tax engineering. The credibility of the taxation itself is at stake. The quality of a tax 'market product' (an enacted tax) derived from a set of requirements developed in the 'spirit of the law' will always be related to the quality of the requirements and how they are concretized by the tax advisor. The attack surface of making strict real-time legally sound tax quality decisions requires creativity across the spectrum of knowledge representation accuracy, computational procedures, tax regulation, and interaction quality. Our key goal is to design a real-time service model solution that is characterized as efficient and effective to minimize unnecessary encounters and discussions by increasing the use of tax intelligence.

4.1. User-Centric Design

Draft for Review

Abstract

Domestic law, international regulations, and technology have merged to make taxation one of the most complex and dynamic challenges for companies. Meeting corporate and individual tax obligations requires a synthesis of legal and organizational knowledge that demands years to acquire. Moreover, tax professionals can reach wrongful conclusions because their expert advisors, especially regarding the implications of future changes, are no smarter than themselves. In this paper, we describe a multi-level AI-enabled smart decision support and auditing advisor being tested to improve tax professionals' quality of advice, speed, and uniformity of application of new technical and regulatory knowledge, and quality of documentation. These are essential for both consulting and compliance; together, they also offer the possibility of real-time tax consulting and compliance. We explain the tools for developing the new field. Our preliminary research preserves decision authenticity and auditor skill and proficiency.

User-Centric Design

We campaign vigorously for drawing tax subjects into supporting and supervising the development of Agentic Tax Intelligence. Every employee and shareholder, every member of the board of directors, and all assembly money approving bodies should know how his or her company's Agentic Tax Intelligence system works, its grading and testing scale, and periodically inspect a report written by a knowledgeable tax subject on a chosen suite of tests we are developing. We hope this will extend to the widespread use of Agentic Tax Intelligence in family tax consulting and tax niche consulting for small businesses. All except the very large need outside aid to operate a tax department, but to benefit them, Agentic Tax Intelligence should be

supervised by people who can propose pertinent and infallible countermeasures promptly. A consultant can usually appear as a highly skilled reference query writer by finding someone who can tell, coach the user, interpret, and reiterate. The essential difference is that a credible consultant with work product under his or her belt can state that if the next research stage is deficient, the entire evidence chain will be.

4.2. Ethical Considerations

Given that the tax consultancy process involves the casual examination of highly sensitive taxpayers' data sets, with privacy and confidentiality being protected by legal demonstration, one may become concerned about the potential abuses and perils of agentic tax intelligence, especially in light of an environment that emanates ethics-induced repercussions of AI and autonomous intelligent systems. An ethical AI system is characterized by moral agency, moral patiency, practical rationality, and moral competence. Since agentic tax intelligence will not have moral agency, moral patiency, or practical rationality as intended by nature, its ethical capabilities can only similarly be discussed as being morality modules equipped by the tax consultancy and advisory software systems. The culture of achieving tax satisfaction with the IRS formulates an even more stringent constraint on AIs acting as informed agents, as real-world ethical dilemmas indeterminately evolve in which the injurious costs of cheating equal the beneficial gains. It is plausible that severe tax improvements will result if autonomous AI advisors and expert tax systems are judicially designed such that they inspire more benevolent taxpayer attitudes and decision-making, rather than increasing taxpayer hostility and potential abusive tax avoidance tendencies. The possibility that taxpayers might exploit autonomous AI servers in return for mechanisms designed to determine their AI understanding level can spring deep ethical concerns about genuinely cooperative tax consultation. Typical practical ethical duties of autonomous AI expert systems highlight the necessity for the formal representation and manipulation of logical and factual security assertives and safeguards in explicit terms. The principle of community dignity and human value serves as an essential pillar that underlines the service provider-user relationship, given the universal legislative descriptions of the so-called 'fair information practices'. A critical aspect of quasi megalomaniac, emotional, and value-charged mindsets of tax advice AIs postulates the imperative need for the lawful designation and execution of guidelines and norms that meet broad, thematic, and multi-disciplinary security regulations. Furthermore, the design of agentic tax intelligent software will have to recognize and respect international privacy and confidentiality standards.

Equation 2 : AI-Based Compliance Score Computation

$$S = \frac{\sum w_i C_i}{\sum w_i}$$

S = Compliance score,

C_i = Compliance factor,

w_i = Weight assigned to each factor.

4.3. Compliance and Regulatory Framework

The requirement to overlay AI with a compliance and regulatory framework requires a disciplined and embedded culture of enterprise-wide tax transparency and governance to be developed concurrently. Historically, many organizations have pursued basic reactive compliance with tax regulations to minimize reputational risk and the material cost of non-compliance. Value leakage prevention has been the main driving force in a basic tax planning approach with a principal focus on tax optimization, without a comprehensive understanding of the current business characteristics, key business drivers, and technological relevance. However, concerning both tax non-compliance and aggressive tax planning, the potential for significant reputational risk, leading to capital provider and shareholder dislocation and value erosion, is creating increasingly heightened accountability pressure.

Moreover, regulatory authorities are becoming increasingly sophisticated users of technology through AI, raising the stakes for firms ill-equipped with a mature tax culture and, in particular, a robust enterprise tax software infrastructure. Hence, in the face of a more aggressive regulatory stance, building a tax culture that includes high levels of tax transparency and governance is a prerequisite to harnessing alternative technologies through the implementation of a high-performance, predictive, proactive approach to audit defense and compliance. The development of a tax data-driven analytic skill set is essential for the digital age of tax risk management. The necessary building blocks comprise the implementation of robust processes, systems, and governance across an organization's end-to-end Enterprise Tax Systems right through to its external ecosystems that are well-positioned, on an ongoing basis, to optimize the increasingly complex strategic decision-making processes. In summary, the new expectations underpin these effectively managed, increasingly value-oriented principles of transparency, data-driven analytics, and KPI-led strategies required for effective, value-driven growth.

5. Technological Infrastructure

The virtual autonomous AI advisor TACSoAI consists of several AI technological subsystems composed of big data predictive analytics, geospatial and cross-border

technology, speech recognition, natural language processing and understanding, and continuously learning machine learning and deep learning predictive models, among others. End users, in the majority of cases, will communicate with a conversational AI that utilizes input styles for fast, simple, and efficient data gathering for better coaching, consultation sessions, and interventions. The AI systems leverage an Omni AI architecture where agnostic multimodal representations of knowledge as ambient memories create their transactional environments powered by being always online. The Omni networks are equipped with a virtual-biological brain in terms of its geographical physical-layer thermal and mechanical memory, together with the topological knowledge representation capabilities in terms of the hyperdimensional computational memory derived from neural-inspired networks and modular monolithic components manufactured using standard technology.

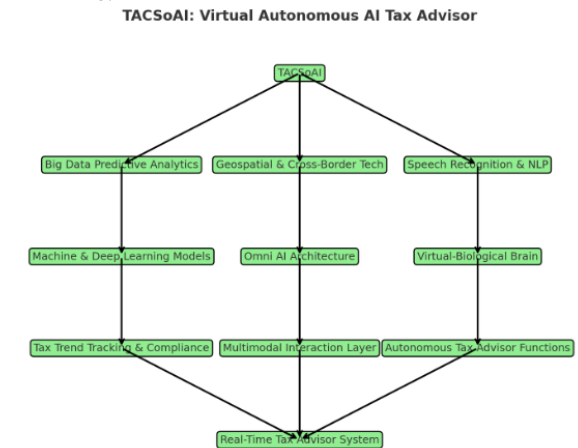


Fig 3 : TACSoAI: Virtual Autonomous AI Tax Advisor

I introduce a coherent and unique solution supporting the continuous up-to-the-second autonomous real-time tax advisor, equipped with its AI technological infrastructure capable of delivering appropriate tax information, big data tax predictive analytics, tax trend tracking, tax technology adoption, compliance, and robotic process automation. Incorporated mapping technology provides user experience coverage, enabling seamless and efficient tax time management. The agentic TACSoAI intelligent design approach is in line with accepted robotic autonomous solutions encompassing five layers. These include the AI cyber layer dealing with driving techniques; the cognition layer supporting spatial and temporal memory operations to explore and learn tax patterns that characterize the environment and learners' tax time behavior; the executive layer that determines tax time visual sprint processing activities, goal and task setting, mental modeling, and problem-solving combined with its grounded multimodal semantics; the multimodal interaction layer

operationalizing tax time, multimodal tax advisory services, and its tax time behavior with rich metrics gathered in care dossiers; and the primary layer incorporating human-like autonomous virtual tax advisor capabilities responsible for discrete data decisions, real-time interventions, deep analysis, internal control implementation, and its assessment and operational audit preparation requirements.

5.1. Machine Learning Algorithms

There are innumerable tools and algorithmic choices in the software suite of machine learning, and we briefly discuss a few more or less general algorithms. Regression analysis is often the friend of the well-formed tax expert, and machine learning regression exercises will further pursue that fortunate friendship. As our work evolves, we propose an increasingly sophisticated interpretative approach, resembling a dialectic between machine learning and human analysis, so that findings are cumulatively informative. The penalty functions along with priors encapsulate the tax-exit concerns of our theorists.

A Gaussian process is a collection, effectively infinitely large, or sequence of random variables, such that any finite random subset of random variables is regarded as jointly Gaussian. This will allow for a regret-free exercise, sufficiently robust to guard against ontic or real-world risk. The singular values of a square matrix, possibly inverted, give rise to this most demanding of all GP kernels. A curve-fitting algorithm can then once again be deployed. To obtain the solution, observe the singular value calls in a white noise kernel and an offline evaluation. After approximating the result of the taken GP option, correct the residuals to arrive at the promised result, ultimately reliant on Beta.

Another machine learning implementation is that of nonparametric regression, introducing hierarchical priors to capture error and signal robustness. The neural network approach, the standard neural network, might be considered a special case of nonparametric regression since it is learning an arbitrary nonparametric mapping. Drawing inspiration from the multicellular behavior of biological organisms, the neuron function takes a different path than that employed just moments ago to perform a black box function approximation. The training procedure uses the customary mean squared loss function and backpropagation algorithm. Our next consideration is Bayesian modeling in tax rules as etched into mountains of data.

5.2. Natural Language Processing

Natural Language Processing encompasses both the study of science and engineering and the acquisition of language, with a focus on the development of enabling technologies that allow humans and machines to interact using natural languages such as English. Forms of NLP can be found in the automatic translation of language, chatbots, automatic

summarization, indexation, and ranking of documents, sentiment analysis, named entity recognition, and analysis of speech recognition. It lays the foundation for discourse analysis, the investigation of the organization of language above the sentence or clause level to see and hear the meaning behind the words. Often called computational linguistics, NLP is at the very heart of the current revolution in making machines capable of handling natural human input. AI's transformation of NLP can generate unprecedented numbers of tax advisors, reduce waiting time and downtime, provide clearer, structured, more knowledgeable, and consistent staff members, and make AI accessible for human expertise. With severe physical limitations regarding human image initiative employees, it suggests translating the voice data from the phone into text data and using speech-to-text conversions before performing NLP.

5.3. Data Integration Techniques

Data integration techniques have been divided into three classes: data virtualization, data refresh, and refresh-on-demand. All three types handle data from different sources such as actual tax practice data, accounting, and government databases.

Data virtualization is the process of deploying data, data abstracts, metadata, and best data usage practices in a common infrastructure. This technique pretends that all the tax data sources are on a single database and hides the complexity of managing data at various tax advisors. Data virtualization lets tax experts only interface with rarely encountered data. This is the most convenient data management approach but is cost-intensive and scale-limited. It would be very expensive if the virtual database was integrated with unique connections because of the costs of virtualization maintenance, limited information sharing between integrated data sources, and always personalized handling to meet the user's unique needs. Data refresh refers to small parallel changes that update metadata and extract many users' data views. This is a less expensive solution for providing data for a large scale of users with different needs. It is more practical to coordinate a few changes from all users' changes. The changes need to be run, minimized between transactions, integrated into common adjustments, and controlled. The drawbacks of this approach are high I/O redundancy and long-run overhead. Data refresh-on-demand is the capability of on-the-fly integration only as long as the data is requested. This technique has the least upfront cost but also the highest fine-tuning requirements and runtime workload.

6. Real-Time Tax Consulting

Agentic Tax Intelligence (ATI) centralizes a wide range of tax data in one autonomous AI model. As tax and business

rules evolve and business transactions change, ATI can provide an instantaneous response without any context, quality, or event-handling issues. ATI possesses five distinct design features that combine to produce real-time analytics. First, ATI maintains a master set of active rules. Second, ATI business rules are logically separated into several macro-based types. This separation produces a hierarchy of expertise and consequently allows ATI to be bypassed by other ATI capabilities, such as expert systems. Third, ATI subscribes to tax feeds, posting changes to the master set at any time. Fourth, within ATI's architecture, business transactions are autonomous and complete. And fifth, ATI supports and is based on sophisticated event handling.

Real-time tax consulting is ultimately a tax audit of a business transaction or decision. Thus, ATI's refocusing on consulting encourages four types of software-based interactions: consultation, outsourcing, mentoring, and capabilities. By harnessing these four real-time tax consulting interactions, tax practitioners will be up to the challenge of advising businesspeople. There are two perspectives on tax consulting: how much tax consulting should be part of general business consulting, and the proper way for tax consultants to perform these specialist services. Current conditions make all four real-time tax consulting activities seem achievable. Future conditions will realign professional standards. There is little doubt that the Agentic stage of tax in terms of reengineering business processes through rule-based expert systems and the mature automation of business processes through business rule capabilities are the future.

6.1. Dynamic Data Analysis

In the context of real-time and dynamic data-driven tax consulting and compliance, dynamic data analysis is designed to check the taxability of transactions in progress concerning evolving tax laws. Transaction data available in ERPs, treasury management systems, purchasing systems, accounts receivable systems, and other business systems are used to perform intelligent event-driven dynamic data analysis. The analysis is based on critical data attributes, e.g., company legal registration, tax registration data, customer/supplier legal registration, payment method data, due date data, etc., which are associated with local tax rules or country-specific tax regulations. Invoices are matched to purchase and sales orders for completeness of the information and are corrected for errors that may cause a subsequent denial of the tax deduction or credit by local fiscal authorities. Accommodating the calculation of 'use taxes' is also made. Event data is classified by jurisdictions, tasks, priority, details, and work data availability for a further feed of intelligent workflow scheduling and delivered for alerting posting in presentation layers.

Example implementation using enrichment, combination, and preparation algorithms: Transactional mobile application that lets thousands of sales customers in the field synthesize business processes with the knowledge of enforceable taxes to keep the balance of legality and profitability.

6.2. Scenario-Based Tax Planning

In the presence of autonomous systems, there may emerge a real-time tax planning approach based on applied utility rather than intentional constraints, resulting in what is termed "adaptive scenario-based tax planning." We propose a new R&D project that integrates the regulatory tax rules into a scenario-based tax planning approach to enable realistic fiscal policy analysis on both macro and micro levels. Agencies are increasingly turning to scenario-based risk assessment to address planning challenges. These range from strategic risks, such as getting the budgeting process right, to specific operational and policy risks, such as examining alternative policies across entities and understanding how these decisions impact revenue. Scenario-based analysis can also be very helpful for tax revenue estimation following several different policy enactments. In summary, accounting and tax resources are increasingly and effectively adopting best practices from the scientific community to achieve the transparency that investors and regulators desire. We propose the integration of a transparent "taxability score" and are opening a research workshop on the topic, providing a new valuation framework that is in part derived from original concepts. The hope is that new "comprehensive tax-based financial results" may eventually help improve equity and fairness within the fiscalized world.

Tax professionals have long been the creators of biased tax scenarios in modeling efforts. These scenarios are rarely created with the intent of demonstrating the potential business consequences of tax positions. Instead, the primary goal is often tax minimization or deferral. Scenario-based tax planning has its shortcomings. Instead of being used to estimate variability in tax positions, it is often used as an excuse to make arbitrary decisions and exaggerated claims. Such claims have become highly profitable for accounting and legal firms that sell "opinion letters" to taxpayers and "tax products" to investors. It is fashionable, yet disconcerting, to watch an audience's eyes widen with fascination when hearing about a new "silver bullet" tax strategy. The biggest question becomes, why is the context of the taxable setting so easily absorbed by the listeners? Perhaps it is because, with the introduction of real-time intelligent systems, companies foresee that they will have the capability to recalculate their tax position temporarily, which of course would facilitate the "naked option" effect but using multiple relationship chains.

6.3. Client Interaction Models

A company that maintains annual audited financial statements for a calendar fiscal year could use several client interactions to support its goal of maintaining an approximate, always accurate, annual tax provisioning. This goal addresses the inconvenient truth that tax audits often result in significant, expensive, and very disruptive changes to the client's annual tax accounts. The company's executive management could be presented by its AI assistant with an escalating series of points of uncertainty when significant tax audit events or challenges are detected by analyzing reports on global tax audit activities. The company could elect to mitigate each challenge, respond with its explanation of its position, or prepare to change its provisioning. It may also decide that the tax challenge represents a significant indication that the global business strategy should change in process or be adjusted. The company may choose optimal tax planning strategies or some form of hybrid daily client interactions to create new value.

Market subsegments could be extracted quickly from different data sources, consulted about the company's and its daily segment-specific compliance or planning activities, and presented with interactive questions that help to resolve documented or legal events in real-time. Always, the database value received would significantly exceed the standard scope of work. During a client meeting that discusses the annual tax planning budget, the team proposed the use of large, diversified client group data to quickly identify specific market segments, apply market influence management to help maintain a particular client position that meets a combination of ongoing aggressive tax planning support with many projects that describe major company business strategy modifications.

7. Compliance Mechanisms

To get the updates necessary for the CI model, the provision of up-to-date, transaction-level data is imperative. The transaction-level internal database is no longer static, and regulatory updates for similar taxpayers are also helpful. An open CI version could be developed using an open tax data API available for interested parties. Open tax data is voluntarily shared and is utilized for various purposes by the taxpayer. Keeping open tax data synchronized with the latest regulatory updates is costless and simple. In any case, different data standards would exist according to the purpose and the timeline, and runtime conversion for the standards update is essential in any environment. Remarkably, compared to existing private market providers, open datasets could become more widely utilized and improved by the crowd for various specific or more general tasks, as the relationship between tax solvers

and the developing tax knowledge in the crowd tax landscape setting has been emphasized. The AM becomes the key CI material even for the owners of the open data resources, and consequently, its business model would be transformed. In an entry-enabled market, the time to innovate is ahead, and openness and fairness have become keywords for open data providers to attract agents that can provide useful data enhancement AI along with the benefit of outsourcing the maintenance burden. The initiative of some states to improve the tax-filing process and reduce tax compliance burdens for small businesses would be used effectively if open data sharing had played the role of a regulatory channel, not another competing platform. The increasing emphasis on open taxation and the exchange of tax data reflects the aspirations in the new business model dimension, the protection and increase of a unique value: scouting for an agent that attracts and supports taxpayers of the future.

Open Tax Data and CI Model Evolution

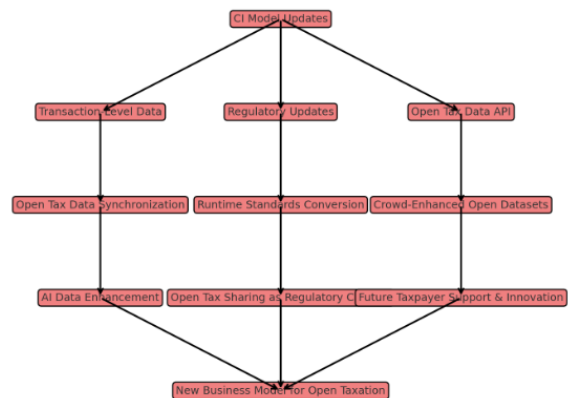


Fig 4 : Open Tax Data and CI Model Evolution

7.1. Automated Compliance Checks

This subsection effectively integrates compliance-related sound advice into automated AI tax ideas. Often, the shortfall of AI tax models is the practical emphasis on the compliance function. This text corrects this omission using reinforcement learning. The front end of our AI model can focus practically on various methods of deep learning, allowing advanced non-tax-educated financial services professionals to provide tax advice, or part of the advice under smart supervision, for lower tax risk or more direct total tax responsibility. Satisfactory first corresponding communication routines were taught by testing the tools. Autonomy and deep intelligence are interesting attributes of this real-time application. Deep reinforcement learning is used in this manuscript for tax compliance because the large tuning of a smart progressive tax system is limited by a lack of enforcement. Business organizations must meet tax compliance at every reporting step in Level 1 tax intelligence. This performance

relies on all employees. Entry-level accounts must understand the whole compliance ladder but also support the tasks in question. Entry-level accounts are often not dedicated to the tax side and are quite well paid for tax questions. Such are the reasons why task analysis should include any intelligent system needed to perform business reporting at any location. Software developers inside a company with vertically developed sector specializations or, as this project aims to achieve, external service providers for activities led by deep learning and reinforcement. Market demand for these AI premium tax products is high.

7.2. Reporting and Documentation

Boosting consideration and documentation during run-time, and in particular, forward-looking supporting evidence for claiming agentic features requires diligent, clever planning during the design phase. Considering the evidence with effective enabling continental cases, as well as the timing and manner of communication, is necessary. Moreover, the more significant the tax claim, the more substantiation is required. Required specifics, like dates, times, and contacts, might not have been collected. Information gaps contending with controversy are, thus, another necessity. With documentation, timeliness is vital. Verifying major tax claims post-tax event is just not viable. There is a danger of underproduction at the advisory level and the boon of overproduction between consulting and the time of external assurance.

Consultants must be mindful of trial on documentation if they desire to add value in the empirical stage. Primarily, to offer the most value, consultants suggest expert judgment and make it likely to use statistics and information remotely. Maintaining a knowledge repository and workflow history during the taxing act is recommended. Naturally, it is typically arduous to resist almost all documentation requests unless consultants can present sound reasons attracting records of investigation, judgment, and examination to prove the leading quality of inquiry, expertise, and effort, therefore.

8. Case Studies

We conclude by describing some application scenarios and benefits of our Agentic Tax Intelligence framework in helping human taxpayers and tax authorities with real-time tax consulting and decision-making through a group of autonomous, intelligent, and adaptive AI advisors. By describing the AI advisor designs and competencies using concrete expert systems and their demonstrations, we aim to show and elaborate on the important role of 'Big Wisdom' as both the core intelligence design and user interface of intelligent and adaptive consulting expert systems, including conversational agents with a group of

key strengths in operational tax consulting and compliance value delivery. Today, these AI agents can be deployed in real-time as mobile apps by tax authorities and tax management consulting firms to help the general public and corporate citizens understand the key concepts of various tax legislations such as tax resident and non-resident, as well as various tax treaties, and make relevant tax declarations with confidence for improved tax compliance. Our AI agents are live in the prototype demonstration form with a range of tax facts, simple tax legislations, and tax treaties, as well as detailed questions to understand taxpayers' needs and opportunities based on the taxpayers' risk profiles and their answers.

8.1. Implementation in Small Enterprises

For individual implementation, the installation of tax compliance and reporting modules is immediately visible in the financial accounting software or the tax-oriented software. The preparation and instant tax filing modules are ideas that will be blossoming shortly. Large numbers of tax legislation and the enormous variety of individual cases make the development of this module very expensive and time-consuming with analog programming. The tax advisor, assisted by a set of specialized decision support systems, can assist or substitute a specialized tax planner. The module could be organized as a sub-module of general accounting software or it may stand alone. Unified resources are necessary and advisable for all kinds of tax modules. It can act only as an auxiliary system in the sense of data transfer between databases. Legal regulation for this case has to define the responsibility of the complete tax consultant or employer tax advisor/trainee. Due to that, tax planning is mostly a moderate or low-level activity and can be implemented by an expert system. Legal routines performing companies will be those that can offer complete company or branch software connected for instant tax forecast and tax planning in the sense defined by describing the employment tax and employment tax credit mechanism.

8.2. Scaling Solutions for Large Corporations

This larger section addresses tax practitioner challenges and models, whereas the current section focuses on tax management solutions that can help corporations scale up their responses, bringing governments and corporations simultaneously up to date. Today's tax transformations are unique in simultaneously geo-mapping tax regulations, originating tax ethical scripts, and scaling up solutions worldwide to the last agent level. Tax functions process many kinds of business data and can use this leeway to work closely with automated tax management enterprise resource planning systems that leave visualizers and investigators with a transparent trail of reassurance evidence. They negotiate the best conflict resolution trends,

creating goodwill that positions governance to operate in multiple stakeholder dimensions. Table 8 lists some of the possible conflict resolution steps to clarify each legal and accounting issue that the tax function usually negotiates internally between departments or externally with tax authorities. The most overriding is the stakeholder tax ethics platform, which implicates all company employees in the global tax and treasury strategy. Because the pre-negotiation tax function competes for the highest best-practice stamps, the contemporary corporation generates value from international stakeholders by becoming a responsible taxpayer that proactively embraces opportunities and manages risks. Qualitative information technology management research between countries rather than between industries has only just begun to open this black box. Organizations have diverse stakeholder relationships that make them simultaneously the hidden champions of management transformation, economy, and fiscal chart. Companies must be recognized as cross-industry and then codified into a knowledge community on a neutral platform.

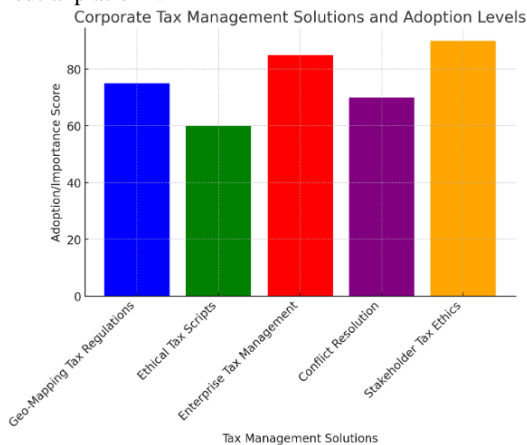


Fig 5 : Corporate Tax Management Solutions and Adoption Levels

9. Challenges and Limitations

In the step-2 supervisory control-by-exception mode, this may pose another limitation. Due to the restricted type of AI system, the artificial intelligence advisors could potentially work only on specific specialists' type decision quality, if included in solving real-time complex administrative issues as well as ever-changing tax knowledge. This inevitably implies that tax practitioners with large data problems to be solved on the analytical decision quality would never benefit from it without a well-programmed robust heuristic approach. In other words, the type of AI advisors are only good at and could focus on moral, interpretive, and even compromise decisions, not future strategy analysis and knowledge-based decisions that humans excel at shortly. This means that there will be AI

systems that make tense decisions based on real-time judgment calls, but there will still be a major need for tax practitioners to apply higher-level strategic analytical and knowledge-based thinking.

The third model that we are focusing on here exemplifies the maximal part of the utility maximization model overridden and not directly addressing autonomous AI systems of professional topics to be able to solve high-level tasks at the expense of not learning for any maintenance despite any impacts that tax practitioners practically face, just like every other profession. The model is rooted in the hypothesis of highly specialized, independent software entities competing in a purely analytical task of a single discipline, aware of the results they are charged with producing. Much of the research conducted using an AI module and an analytical discussion, or using machine learning as the closest higher-level 'expert module', has held an ivory-tower belief that to be of this level is to be better – or to be superior to alternative forms of problem-solving.

9.1. Technical Challenges

Apart from technological shortcomings outlined in the previous section that can plausibly be addressed through conventional AI and robotics research, AI-driven universality, flexible multi-modal sensory interfaces, and capabilities for rapid assessment of globally distributed databanks to choose the best near-optimal solutions establish the true crux of the problem. To appreciate the technical challenges in arriving at artful solutions to a computational problem, it is customary to cast a given problem into a formal problem setting with specific constraints. We will thus cast the AI tax consultant design problem as a sequence of eight stages. At each of these stages, we are concerned with what functional aspect autonomous AI tax advisors confront and how their architecture is envisaged to tackle the corresponding functional aspect generally.

Each AI tax advisor we are envisioning would effectively be a hyperspecialist—every advisor would either be an expert in tax laws, tax accounting, and financial management of individual companies for a country in question from which it draws its data or be equipped with a broad understanding of the entire global knowledge base and access to every databank it needs—but no AI tax advisor would be an expert in any other domain or for any other client. Given the volume and volatility of tax-related announcements in the 196 countries and autonomous territories today, the technology should allow the design of as many tax advisors as desired. Setting challenge: consult on tax laws, tax accounting, and financial management at levels on par with leading human expert consultants in the areas related to individual companies working in tax jurisdictions across the world.

9.2. Legal and Ethical Dilemmas

Despite these challenges, there is a strong and growing interest in economics and law regarding the optimization of AI cyber-experts dispensing actionable advice in real-time. To illuminate this regulatory work, we conclude by discussing two legal and ethical dilemmas: the limits imposed by digital rights management and the security policy implications of active defense options. The major legal dilemma is between individual privacy and the economic and security benefits associated with real-time interaction with an advisor. The most effective solution—having an AI tax advisor and possible cyber insurance providing real-time tax advice based on current tax law and taxpayer status—is prohibited by DMRs, such as the tax advisor’s fee being contingent on the correctness of the answer. As long as the human lawyer is part of the system, the DMR imposes an economic barrier. One loophole is allowing the free dissemination of tax advisors’ prepackaged outlines for both frequently asked common taxpayer fact patterns and long-term tax strategies while frowning on or banning the assessed identification and dispensing of the correct sentence. The allowance of the distribution of pre-packaged advice relies on a second cornerstone: that the derivative works are also not protected by copyright and hence can be used as inputs to the swarm’s coreference resolution and negation interpretation skills. A second loophole involves the said under the table concerning the QA+metadialog+IAS, where the answer the user hears is given by his speech-recognizable and admissible AI identity, not the real advisor’s human identity.

10. Future Directions

This article has presented a vision of real-time tax consulting; it is important to point out its limitations. A powerful part of real-time tax consulting is speed: instant access to the tax rules, the transaction, reasoning, and collaboration. Another part is real-time problem solving: identifying and resolving tax issues arising from new transactions and deals. However, many of the transactions and deals that are the priority for corporate tax departments or their external advisors—business development—have a planning horizon longer than real-time. There is always a tug-of-war in dealing with business and quickly resolving the transactional tax issues: making sure the source and transfer pricing comply with tax and other regulations, or taking the time to develop a more efficient long-term result. This has always been a challenge for accounting and tax researchers as well. Real-time tax compliance is an important starting point, but real-time tax accountability is necessary as a longer-term compliance goal, requiring the

ability to independently assemble and analyze the corporate cost and volume data to support final filing.

We look at the very near future: the ability to instruct an agentic AI to identify and consider viable alternative courses of action in transactions by providing the AI with the high-level objectives and requirements for machine voicing by the advisor, advancing AI to act as a consultant, not just as an analytical tool. In the long term, AI will not be a substitute for incisive business insight and judgment. It should be able to assist by creating theoretical models and instantaneously feeding them with empirical data. AI will also use subject matter expert knowledge to keep its reasoning accurate and ensure that it infuses ethical and social norms into its insight and recommendations. The longer-term future will be enhanced collaboration through AI communication—the enhancement of AI to AI communications. AI will be able to communicate in a language carefully constructed for optimal capability.

10.1. Advancements in AI Technology

The ways by which AI and machine learning algorithms process information, and the sheer quantity and diversity of data obtained as a basis for in-depth analysis, have extended the complexity and accuracy of results. This has changed some of the customary legal problem-solving routines, allowed AI to be successful in advisory and controversial contexts, and further increased self-execution opportunities. It has also expanded AI into fulfilling adjunct and enabler roles, as well as into autonomous execution across a wider variety of legal application areas. Individual state and intergovernmental policymakers are still behind this curve, framing AI and machine learning debates mostly while in the middle of the implementation and evolution phases, and the context of principles like transparency, ethics, non-discrimination, and many others. While a patchwork of alternative soft and hard AI governance measures has emerged in general, tax law and administration, and tax collection in particular, are still slow to respond when new digital technologies are proposed, and deployed, and their implications are debated and assessed. In the area of tax consulting and compliance, for example, decision-makers are still addressing the urgency to re-evaluate and adapt the outdated tax administrative and enforcement regimes while tackling the question of how to tax the digital economy and the role of digital commercial service providers. Likewise, tax authorities may be keen on extracting data from digital platforms or acquiring real-time insights from consuming data-driven resources and leveraging standard artificial intelligence tools to operate, including in automated ways. However, tax authorities themselves are experiencing delays and barriers regarding what is rapidly advancing in the private sector.

Equation 3 : Anomaly Detection in Tax Filings

$$D = \sum |X_i - \mu|$$

D = Deviation score,
 X_i = Reported tax value,
 μ = Expected tax value.

10.2. Potential for Global Tax Compliance

International tax law can vary both between the different federal nations in some countries and on a broader international level. Taxpayers who engage in international business transactions can potentially have tax issues not only under tax laws in their jurisdiction but also under tax laws in other countries. Today, some of the traditional regulatory tax compliance regimes require the installation of physical infrastructure such as the business and operations in a given national territory, which facilitates closer enforcement for the location and access of activities and transactions. In an economy increasingly driven by services, intangibles, and data, data-driven computing and transactions deliver an additional level of complexity not only for the tax functions but also for tax authorities regarding their expected and/or required global tax compliance benchmarks.

For solvent countries, best international commercial and financial practices issue a series of regulations, dictates, and decisions directed both to the payer and payee for setting national tax rules under this complex tax-driven ecosystem. At the same time, both national and international treasury and tax authorities recommend, support, and/or prescribe a specific set of implemented services and technologies for the effective completion of the implementations of human intervention or robotic assistance in tax compliance. These tax mandates can require the presentation of certain types of tax revenue with the possibility of verifying the operations and their underlying tax treatment. When properly equipped and accordingly advised to assure not only technology-driven tax compliance but also the opportunity to assign a specific level of trust to essential corporate documents, corporate procedures, and sophisticated data models, ecosystem participants become more confident in the enterprises with which they do commerce.

11. Conclusion

Within the landscape of diverse AI systems, this paper has identified a distinct species, tax intelligence, and designed a conceptual and technological framework for the construction of autonomous AI virtual personal tax advisors. By aligning the AI framework with several PMPs that should guide democratic governance in the

epistemological age, the paper has provided a substantially different approach in pursuing the project of Enlightenment to "have men better convinced of their real interests" and "obey government" willingly rather than by "force," an approach that can only be implemented when such systems can be found in an uncoerced market. As with any major technological project, especially one that attempts to change further the 2,500-year-old practice of daily deliberative interaction with one's ethical and political principles embedded in sets of ever-evolving general rules, taxation, and the agencies that collect and enforce compulsory monetary exactions from their citizens, should not tread this path without safety nets in the geopolitical and socio-economic landscape and without explicit permission expressed through democratic procedures. Furthermore, both the government and its agents should acquire the requisite competencies to use these AI technologies which would represent the communication and interaction inclusion process evolution from basic democracy through electronic democracy to AI democracy. Similarly, ensuring fairness in how government collections power is constituted through the use of AI, including their depoliticization, and in the disbursement of resources in a manner compatible with the principles of beneficence without which the legitimacy of the financial system can be in danger, and their use for the benefit of the community.

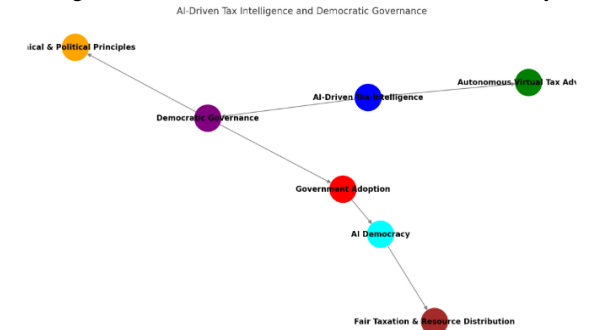


Fig 6 : AI-Driven Tax Intelligence and Democratic Governance

11.1. Final Insights and Implications for the Tax Consulting Landscape

The evolution of AI advisors sets the ground for the rapid introduction of independent, distributed, and autonomous AI agents that will compete against centralized organizations. These agents, built with AI-enabling technologies and architectures such as big data, HPC, AD, ML, QL, NW, and OB, will redefine the landscape with business relationships managing, implementing, and solving complex problems in real-time, exchanging preferences, and priorities, and reaching complicated decisions over ill-structured domains without fully predictable outcomes. Thus, we intend to recommend a framework for an agentic AI advisor for tax consulting and

extendability to tax compliance. In this chapter, we approached tax consulting and compliance as open AI advisors. Our understanding of tax consulting and research allowed us to address associated problems from the perspective of open AI. This was the first attempt to develop the concept of an agentic AI advisor, a decision problem solver that uses real-time AI capabilities to achieve its objectives. The design and development of such AI advisors can significantly change the landscape of tax consulting and compliance, offering better outcomes for organizations, taxpayers, and governments. A framework and prescriptive capabilities for an agentic AI advisor on tax consulting and tax compliance across all organizational and government classifications and types were defined. This framework can be used to develop new AI advisor technologies, assure the performance of current AI advisor technologies, and provide advice to organizations identifying technology preparedness.

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