Exploring the Future of Taxation: A Blockchain Scenario Study

Rijswijk, L. van; Hermsen, H.; Arendsen, R.

Exploring the Future of Taxation: A Blockchain Scenario Study

van Rijswijk, L.[1]*, Hermsen, H.* [1]*, & Arendsen, R.* [12]

1. Introduction

As we are approaching the 2020s, the incremental maturation of a number of so-called disruptive digital technologies offers promises of radically reshaping our society; from the way people and businesses produce value and goods and provide services to the way they manage their daily interactions with one another. The portended disruptive effects they may inflict on our economy have been noted by policy makers and scholars alike, referring to our current era as a 'second machine age' (Brynjolfsson & McAfee, 2014) or the 'fourth industrial revolution' (WEF, 2016). Just a few examples of these technologies include the internet of things, machine learning and artificial intelligence, and blockchain or distributed ledger technology. The broad span and rapid expansion of these technological innovations are made possible mainly by a world that in recent years has progressively become a digital world in which few areas of our collective experience remain untouched by digital technologies. Where the first stages of digitalization may predominantly be characterized as a one on one translation of the existing non-digital world into a digital one, increasingly the broader possibilities of using the available and upcoming technologies for transforming society at large are being explored in more detail as well.

Revenue bodies, representing an important link in the effectuation of the 'social contract' between (national) government and its industry and citizens, operate in the dead center of society and are consequently expected to readily adapt to changes in their environment (e.g., Gupta, Keen, Shah, & Verdier, 2017; OECD 2018). At the same time, however, revenue bodies across the world are often facing budget constraints and are frequently asked to do more with less. Moreover, many revenue bodies face additional challenges such as an aging staff or a more demanding population (Fabregas Fernandez, 2017; OECD, 2016). One way to address the balance between pro-active adaptation and (financial) constraints is to consider how the currently available and upcoming technologies may be used to increase the efficiency and effectiveness of existing business processes. Just in the last few years technological advancements, such as pre-filled tax returns, personalized web portals and single financial accounts, have already impacted many business processes of national revenue bodies from tax

[1] The Netherlands Tax and Customs Administration (NTCA)
[2] Leiden University, the Netherlands

service delivery to compliance risk management (HMRC, 2015). Indeed, many of the typical business processes of revenue bodies have been shifting more and more toward the (automatic) processing of complex digital information and the (automated) execution of large quantities of transactions (Arendsen, 2016).

Yet, while a modernization of existing processes may indeed prove inevitable, it may simultaneously detract attention from other ways in which revenue bodies may profit from new and upcoming technologies, for example by considering the possibilities that these technologies offer for *transforming* their current processes to sort better effects in the long run. Taking this a step further, the OECD maintains that 'the fundamental re-examination of the tax system as a whole goes far beyond simply facilitating existing operations' and puts forward the notion that the successful application of information technology will determine the future success of revenue bodies, both in managing compliance risks and meeting rising service demands (OECD, 2016). Even more broadly, upcoming technologies may offer an opportunity to reconsider and rethink what government can and should be doing (UK House of Lords, 2016).

The main challenge in taking a more long-term perspective in assessing the opportunities that novel technologies have to offer is that it is often difficult to predict where current developments might lead and how these developments, and any unexpected consequences that come along with them, may impact society at large. It is thus important for revenue bodies to have relevant information and to develop a systematic approach to identifying and exploring which (technological) developments may impact society and offer the most relevant potential to impact the delivery of tax services (OECD, 2016). Embedding such a systematic approach within the revenue bodies' strategic planning function offers revenue bodies an opportunity to reflect on potential consequences for current and future business processes and to inform a sound (digital) strategy to be prepared for and to take advantage of long-term challenges and opportunities (*e.g.*, Regan, 2016).

In the current paper, we report an illustration of such a strategic planning study performed by the Netherlands Tax and Customs Administration (NTCA). In this scenario study we employed an explorative scenario planning methodology, which we applied to understanding the potential impact of distributed ledger technology on society, and ultimately on revenue bodies. Distributed ledger technology (DLT), of which the *blockchain* technology underlying Bitcoin is presently the most well-known manifestation, is an example of a potentially disruptive technology that is currently sparking a high degree of public interest, offering a novel digital infrastructure for (economic) transactions. The aim of the study was to

facilitate the strategic discourse within the Dutch tax authority with respect to the implications of DLT in a tax context. However, before we continue with describing the methodology and results of the explorative scenario planning approach to DLT, we will briefly cover the basics of blockchain and DLT in the following section.

2. Blockchains and distributed ledger technology

A *disruptive technology* may be defined as a technology that provides such radical solutions to existing inefficiencies in a particular ecosystem that it comparatively rapidly displaces established technologies. As such, these disruptive technologies can be differentiated from *sustaining technology* that incrementally builds upon existing models and ideas (see e.g., Christensen, 1997). With the current hype surrounding Bitcoin and other cryptocurrencies, blockchain technology is one of the first technologies that comes to mind for both the technologically savvy and the technologically uninformed when asked about which current technologies bear the potential to be a disruptive technology. So, what exactly is blockchain technology? At the very core, a *blockchain* is a system of decentralized computer nodes that collectively run and maintain a shared, identical database. As such, a blockchain is a specific type of distributed ledger. A blockchain database consists of blocks of transactions and each new block of transactions that is recorded into the database is mathematically linked (or chained) to the previous group of transaction, with all network participants verifying the authenticity of each transaction through the shared history of all recorded transactions. The content of the transactional entries is not limited to financial transactions but each entry may represent any type of information, from personal information to location data or records of financial assets.

Key characteristics of blockchain technology include transparency, efficiency, robustness, and safety (*e.g.*, Tapscott & Tapscott, 2014; Sim, Owens, Petruzzi, Tavares & Migai, 2016; WEF, 2016). For instance, blockchains are capable of achieving radical transparency through the immediate replication of data among network participants. Every participant or party to a transaction thus retains and operates efficiently off a single, shared version of the truth in real time, eliminating record keeping in centralized data siloes and the constant need for verification and reconciliation between parties. In effect, blockchain technology offers the possibility to truly *share* information as opposed to merely exchanging information. Moreover, once a block of transactions is verified by the network participants and recorded onto the blockchain, a single node in the network cannot feasibly alter the distributed records without detection by the other nodes in the network. This characteristic of blockchains

is referred to as *transaction immutability* and is one of the key features that enables the oft cited elimination of the need for an external enforcer or trusted third party (*e.g.,* banks) in establishing trust between parties in a transaction. Additionally, the multiple cryptographic techniques that are being employed by blockchain technology promise to ensure security for both network participants as well as their transactions, whereas the absence of a single point of failure, where a single entity is responsible for controlling data or information, vastly reduces risks associated with cyber-attacks such as Distributed Denial of Service (DDoS) attacks or Man in the Middle (MitM) attacks. A final concept that is essential to point out in the context of discussing distributed ledgers more generally is the *smart contract*, where blockchains and other types of distributed ledgers may also be used to drastically lower the costs of executing contractual transactions by encoding the standardized terms of the contract into bits of software, running on a distributed ledger, that are programmed to settle automatically once the terms in the contracts are verified. New specific questions arise with respect to legislation and regulation concerning, for example, the legal status and significance of these 'contracts' and their outcome (Dutch Blockchain Coalition, 2017).

While the characteristics described above generally describe blockchain technology specifically and other sorts of distributed ledgers more generally, there exist many different models, each adapted to specific applications of the technology. The most well-known example is the model underlying Bitcoin, which is a *public* and *permissionless* blockchain model in which everyone who so wishes can participating as a node in the network, download a replication of the entire database and start contributing to it. In these models, there is no need for intermediaries of any kind, with user depending entirely on system integrity. However, other applications operate more *private* and/or *permissioned* models in which other participants or an appointed authority (trusted third party) may put restrictions on who is allowed to view the transactions or who is allowed to contribute to the network and database. Such closed models are typically focused on efficiency and optimizing transactions within specific (commercial) domains.

In Christensen's definition of disruptive technologies (Christensen, 1997), we find the notion that disruptive technologies should offer radically efficient solutions for existing inefficiencies in an ecosystem. In the public domain, which we are concerned with in the current paper, proponents of DLT claim that the key characteristics of blockchains and other distributed ledgers outlined above offer potentially radical solutions for difficulties (or inefficiencies) that governments in general and revenue bodies specifically are facing today. For example, real time

access to shared databases of tamper-proof information may mitigate or even eliminate issues with ensuring that the data fundaments used in a range of government activities are accurate and complete; issues that are becoming ever more evident with large amounts of data currently stored in an increasing number of different databases across (government) organizations (UK House of Lords, 2016). The potential mitigation of the currently problematic management of centralized data silos is perhaps most apparent for revenue bodies, typically relying on a fair amount of information obtained from third party sources that also record their own information in their own database and their own data format.

Despite these, and other, claims being made regarding the impact that DLT may have on revenue bodies over the whole range of activities, from debt collection to compliance risk management and service delivery (*e.g.*, Sim et al., 2016; WU Global Tax Policy Centre, 2017; WEF, 2016; IOTA, 2017), present strategic policy planning efforts and strategic reflections on the position and role that tax authorities have in a changing world are hampered by the relatively large margins of uncertainty that exist with respect to understanding the ways in which DLT developments will progress in the foreseeable future. The challenge appears to be in accomplishing a sufficient grip on the type of transformations we may expect, how these transformations will manifest themselves, and ultimately in how these transformations will have their impact on society. To facilitate the strategic discourse on the topic of DLT for revenue bodies in general and the NTCA specifically, we used explorative scenario planning to systematically capture the most important uncertainties pertaining to the future development of DLT and how these may affect society at large.

3. Scenario planning

The method of scenario planning is based on the assumption that it is both necessary and efficient for organizations to invest in future planning, to enable managers to take account of long term aims in their daily decision (van der Heijden, 1998). There are many different approaches of constructing and using scenarios. One main distinction between these approaches is between forecasting and foresight (*e.g.*, Cuhls, 2003). In *forecasting*, scenarios are an exploration of current trends (extrapolative approach), driven by the question what the future might look like in a given area. It is a more quantitative approach, usually resulting in three scenarios: a positive, a neutral and a negative scenario. This type of scenario planning is mostly used in social-economic decision making. In the Netherlands, for instance, the Netherlands Bureau for Economic and Policy Analysis (CPB) is a main provider of this type of scenarios for the Dutch government. *Foresight* on the other hand is a more qualitative approach where

one is interested in exploring a wide range of possible future impacts of current development that are characterized by high uncertainty (see, for example, Arendsen, ter Hedde & Hermsen, 2011). Another type of distinction that can be made with regard to scenario building is the distinction between *normative scenario's,* in which a desirable future is presented (assuming that one can have influence this future), and *environmental scenarios,* which explore the uncertainty of the future by sketching a range of different imaginable scenarios. These are not mutually exclusive as some types of scenario's are hybrids, combining more approaches into one strategic planning exercise (for example, see Hanson, Reesson & Staples, 2017).

In the scenario planning study described in the current paper, we were keenly aware of the limited influence that the NTCA, and tax administrations in general, have over the way in which highly complex developments such as DLT will play out in the long term. Moreover, given the potential for disruption or paradigm shift, extrapolating current trends was not a feasible option, and we were principally interested in using a wide range of qualitative sources to explore different possible ways in which DLT developments may impact society at large. Our scenario planning study may thus be classified as using foresight to build environmental scenario's. The resulting scenarios are neutral; they should neither be considered as positive and desirable futures or as negative and thus undesirable futures, they are simply possible futures. Moreover, our approach does not attempt to eliminate uncertainty or to predict what is simply unpredictable. Rather, it emphasizes uncertainty and ambiguity, which reflects the playing field in which strategic decision making takes place. Importantly, the resulting scenarios should not be considered a goal in itself. The scenarios were constructed as a tool for facilitating meaningful strategic conversation among strategic decision makers.

The scenario building process

There is no single proven recipe for building scenarios (van der Heijden, 1998; Nekkers, 2011). Although some steps in the building process are inevitable, such as the identification of relevant uncertainties or the creation of a story line, other available steps from the scenario building toolkit may be run through more implicitly or even omitted dependent on the goal, available time and expected thoroughness of the study. Below, we outline the process steps we followed in developing the scenarios for the current study. Important to note here is that although the steps outlined here are presented as chronological steps, the process of scenario building is an iterative and partly parallel process, where one fine-tunes the previous steps while working on the following steps.

a. Formulating the strategic question.

To develop relevant scenarios, it is crucial that the process starts with a well formulated strategic question concerning the future. This question determines the focus of the scenarios, the time horizon and the relevant topics that have to be explored in the scenarios.

b. Exploration.

During this step, information is gathered on the subject matter, trying to find answers to questions pertaining to the state of the art of the global topics covered by the scenarios. In addition, meaningful current and expected developments are mapped. Which developments are almost certain to unfold and which developments are surrounded by ambiguity and uncertainty?

c. Identifying the most important uncertainties.

After the exploration phase in which a large number of developments are superficially identified, this next step of the scenario development process focuses on assessing which of the ambiguous or uncertain developments would be most relevant when assessing societal impact of the subject of interest.

d. Creating the scenario stories.

Scenarios are narratives of possible futures. These narratives should be plausible, logically coherent, relevant and, perhaps most of all, challenging, in order to serve as a proper tool for strategic decision making.

e. Determining early warning signals.

With the scenario narratives as a starting point, potential near-future events which would lend credit to a certain scenario becoming reality are explored. These *early warning signals* serve as an indication for strategic decision makers that 'reality' tends to move towards one particular scenario rather than another.

Participants

Two groups of participants have contributed to the development of the scenarios in the current study. One group consisted of (inter)national DLT experts from the private and public sector, who either participated in two expert workshops or were interviewed personally. These

experts were consulted for the exploration phase (b) and for identifying the most important uncertainties (c). The second group of participants consisted of NTCA employees in strategic roles from relevant organizational departments (*e.g.,* customs, large enterprises) and served as an advisory board. The advisory board contributed a tax authority perspective and ensured organizational relevance of the scenarios. As such, the advisory board was consulted for determining the strategic question (a), creation of the scenario narratives (d), and determination of the early warning signals (e).

4. Results

In the previous section we outlined the general used to build the scenarios. In this section we present the results of each step in the scenario building process. Given the iterative and sometimes parallel nature of this process we combine some steps in our presentation of the results. For example, the identification of relevant uncertainties in DLT developments has undergone several iterations of exploration, identification and fine-tuning (step b and c). For each results section, we have indicated which process steps were involved.

The strategic question (step a)

The strategic question was formulated during an introductory session with the research team and the internal advisory board. After a short discussion on the main topic of interest (*i.e.,* DLT) and an introduction to the method of explorative scenario planning, the scope of the project and the main aims of the project were determined. The main goal of developing the DLT scenarios was providing input for the tax administration's medium to long-term strategic decision making. It was thus agreed that the scenarios would broadly focus on exploring the impact of DLT on society in *2025*, with special attention given to domains relevant for taxation (*e.g.,* finance, employment, economic transactions, etc.). The research question underlying the development of the scenarios was formulated as: *What is the potential impact of DLT on taxation in 2025?* The scenarios provide the basis for strategic discussions exploring how DLT may impact revenue bodies' internal organization and tax processes, and how revenue bodies may prepare themselves for various potential future outcomes.

The identification of the most relevant uncertainties (steps b and c)

Input for the identification of the most important uncertainties of DLT was collected using (a) desk research, (b) 8 interviews with DLT experts, and (c) an expert workshop with DLT experts. Firstly, the desk research focused mainly on the characteristics of blockchains and other distributed ledgers and gaining an understanding of the 'state-of-the-art' in the DLT domain.

Secondly, in the interviews with DLT experts from academia, industry and the public sector, the focus was on explicating their views on current and future developments of DLT. Lastly, the expert workshop focused on future developments of DLT, exploring with DLT experts from academia, industry and the public sector which developments will promote or suppress future adoption of DLT as well as exploring the strengths, weaknesses, opportunities and threats for DLT (SWOT analysis).

Analysing the input thus gathered, two uncertainties were identified (and validated in a second expert workshop) as the most important uncertain elements impacting society in general and taxation in particular. These were a) *government engagement* (active vs. passive), and b) *the dominant DLT-type adoption* (predominantly public and permissionless vs. predominantly private and permissioned). With regard to the role of government, at one extreme is the government that (intentionally or not) is lagging behind in providing a regulatory framework for this type of innovations to mature and be implemented. On the other extreme is an active government that facilitates this type of innovation by providing regulatory framework, stimulates societal application of the technology and acts as a launching customer. Different types of distributed ledgers have been briefly discussed in section 2. With regard to the type of DLT that is (predominantly) adopted, one extreme in our classification is the adoption of predominantly public, unpermissioned DLT-types (*e.g.*, the Bitcoin blockchain) which are open to everyone[3]. At the other extreme is the predominant adoption of more private and/or permissioned DLT-types which put restrictions on access, transparency and permissions for contributing to the ledger.

Each of the two uncertainties can thus be imagined on a continuum with the extremes referring to different ways the future might unfold. Mapping the two uncertainties along two axes into a co-ordinate system results in a framework from which four opposite and alternative scenarios can be derived (see Figure 1).

[3] See also section 2

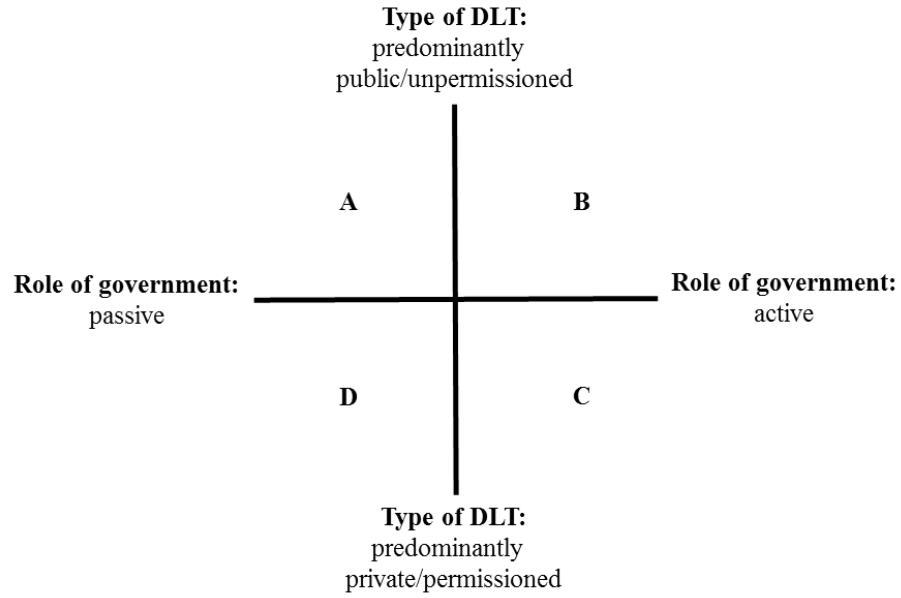

Figure 1. Most important uncertainties of DLT developments mapped along two axes

Expansion of the uncertainty model (step c revisited)

There are roughly two approaches to the creation of scenarios. In the first approach the two axes from the framework based on the two most imported uncertainties (such as the two axes in Figure 1) are used as the fundament for creating four scenario narratives along the axes. In the second approach, the axes are merely used as temporary 'scaffolding' for creating the scenarios. Once the first outlines of the scenarios are finished, the scaffolding is removed. The latter approach is best suited to complex topics that are not easily reduced to two factors.

In the current study, four scenario outlines were created using the framework presented in Figure 1. Feedback on these outlines from the group of consulted experts and from a workshop session with the advisory board made clear that the impact of DLT on society is too complex to model along just two uncertainties. To do more justice to this complexity, the 'scaffolding' was removed, the two uncertainties were redefined, and two additional impactful developments from the identification phase were introduced. The four developments thus included in the subsequent elaboration of the scenarios were:

a. *Governance.* Legislation, regulatory frameworks and government supervision all contribute to the survival rates of innovations. The government can take on different roles in influencing innovations, for example as a user, launching customer, a funder or a regulator and supervisor.

b. *Industry.* The extent to which industry invests in research and development of a new technology contributes to the ultimate success and impact of an innovation. Businesses not only need to focus on the invention of new technologies, but also in its applications and the distribution of these applications.

c. *Acceptation of and trust in DLT by society.* Innovations will only be successful if they match existing systems and if they are accepted by users and by society (Maclaine Pont, van Est, & Deuten, 2016). Acceptation consists of the awareness of the innovation, the deliberation and decision to adopt and the use of the technology in daily life (Ben Allouch, 2016).

d. *Extent of DLT (de)centralization.* Decentralization is one of the main characteristics of DLT. Yet, there also exist DLT models that are much more centrally organized, with one or a few parties in control over access and content (see also section 2). The impact of DLT on society may depend on the extent of (de)centralization of the dominant DLT type applications.

The four scenario narratives and early warning signals (steps d and e)

The enrichment of the scenario building blocks from two to four relevant uncertainties described above complicates the scenario building process. Where the scenario axes approach naturally results in four different scenarios (see Figure 1), expanding the morphological field with more uncertainties quickly increases the number of possible scenarios to be worked out. Yet, it is conventional to construct up to a maximum of three to four scenarios, seeing that consideration of a larger number of scenarios weakens narrative distinctions and obfuscates the effectiveness of efforts aimed at overseeing and comparing consequences of the various scenarios. On inspection, the four scenario building blocks as defined above do not naturally result in three or four scenarios, but because these building blocks are not strictly orthogonal, some combinations of the building blocks yield scenario narratives that are not very plausible or logically coherent. Through an iterative process, involving a workshop session with the advisory board, we selected the four most plausible, relevant and distinct combinations of the scenario building blocks. Table 1 provides an overview of the resulting four scenario narratives and how they relate to the four scenario building blocks.

Table 1. The four scenario building blocks in the four scenario narratives

Scenario	***A. Dual Reality***	***B. Blocktopia***	***C. Govchain***	***D. Beyond the Hype***
Government involvement	-	+	+	-
Industry involvement	+	+	+-	-
Societal trust and acceptation	+-	+-	+	-
Type of DLT	+-	+	+-	*not applicable*

The scenarios were then worked out according to the four scenario building blocks. Each of the resulting scenarios is described along four main narrative lines that roughly match the four scenario building blocks outlined in the previous paragraph: *governance*, *industry*, *cryptocurrencies*, and *society*. The scenarios are each preceded by a short introductory section in which a typical day in the life of a Dutch citizen inhabiting that particular future scenario is described. Each of the scenarios concludes with an example of how a Dutch company selling audio equipment imports products from China.

To provide the reader with an impression of the results, we present a translated and abridged version of each of the scenarios below.[4] In addition to summarizing the main body text of the scenarios, we also removed the introductory and concluding sections. Each of the scenarios presented below now concludes with some examples of relevant early warning signals for these scenarios. These early warning signals were generated in the final workshop session with the advisory board.

[4] If you are interested in the full output of the scenario study, please send an e-mail to l.van.rijswijk@belastingdienst.nl.

Scenario A: Dual Reality

Governance
In the years leading up to 2025, developments in DLT were largely ignored by the Dutch government. Although some pilot initiatives were initiated over the years, government officials became hesitant, failed to invest in blockchain and other related technologies, and accordingly did not adapt legislation and regulations. The government had difficulties determining the course in a new digital world in which there is much uncertainty about which directions the developments might go. Considering that the process of drafting and implementing new legislation and regulations takes considerable time, government is now lagging far behind with regard to DLT. At the same time, a trend is visible in which the Netherlands is slowly moving towards an *automatocracy*; whilst transactions and interactions in society are becoming more and more automated, the Dutch government is becoming increasingly isolated from these developments. For instance, private parties regularly organize public referenda on topics such as the future of the country or a certain municipality. Currently, the Dutch government has no idea as what to do with the outcomes of these referenda.

Industry
Despite the attitude of the authorities, Dutch industry kept up to date with international developments in DLT. Many enterprises invested strongly in blockchain applications and took responsibility for developing standards and regulatory frameworks, if only to fill the regulatory gap that the authorities left open. These developments have created a rather complicated dual reality. For example, while (international) enterprises complete mutual transactions using cryptocurrencies, they are expected to convert these transactions to the local currency in their national tax declaration.

Cryptocurrencies
Due to the lax attitude of the Dutch authorities, plenty of parties seek the grey area of legislation. Cryptocurrencies are not under the responsibility of a country, a central bank or any other financial regulator and criminals try their best to perform transactions as anonymous as possible. Commonly used cryptocurrencies make use of zero-knowledge protocols that render it impossible to determine who, where and what is paid.
A myriad of ICO's are being used to finance all kinds of projects. Without regulation or control by any authority, investors are hardly protected against fraud and the number of ICO-fraud cases are numerous. However, because of the large profit margins and the success stories of some famous ICO-millionaires, new cryptocoins are still highly attractive to potential investors.

Society
Societal trust in and acceptation of DLT is limited, for example given the negative publicity surrounding cryptocurrencies and ICO's. Companies have put the interests of innovation above the interests of reliability and privacy, while DLT criticisers point out the dangers of the rapid developments in quantum computing, which in time might make it feasible to crack DLT encryption. There is also a reluctance regarding the use of smart contracts, given the lack of quality standards and the structural uncertainty of these contracts.
Moreover, an important prerequisite of trust in DLT is that one can trust the identities and titles recorded on a given blockchain. Yet, the lack of options provided by Dutch authorities to formally document identities and titles using DLT has prompted the emergence of private identity bureaus where one can register ones identity using DLT, another example of the dissociation of the authorities from services that were typically provided by the government for hundreds of years. In general, most people are reluctant to use DLT for large transactions such as houses and cars, which is good news for the likes of intermediaries such as solicitors and for commercial entities active in the sharing economy industry.

Early warning signals:
- More and more start-ups and large tech companies make use of private blockchains.
- Public authorities do not give much attention to blockchain technology, while the private sector is strongly investing.
- Negative publicity in the media with respect to crypto currencies and ICO's.

Scenario B: Blocktopia

Governance
Following Estonia, the Netherlands was the second European country introducing digital citizenship. This allowed not only the Dutch, but everyone in the world to become a digital citizen of the Netherlands and thus the European Union. This Dutch e-residency attracts entrepreneurs from all over the world who now can trade freely with the European Union.
In the years preceding 2025, legislation and regulations were quickly adapted so that most transactions can now occur digitally. The government tries to eliminate all obstacles that interfere with this process and by providing the framework on which the decentralized system depends, the government holds a strong position in society. Every European citizen owns a digital identity. However, in order to obtain a digital passport physical identification is still needed by an attestation provider appointed by the government. This digital identity with a signature of the government is placed in ones self-sovereign identity wallet, enabling every citizen to maintain sovereign control over their own personal data. DLT enables other parties trust that the identity related information someone provides corresponds with the administration of the government.

Industry
The DLT revolution was primarily set in motion by start-ups and innovative small enterprises. Rapid technological improvements of DLT in the areas of energy saving, scalability and security were realized. Open source is currently the standard. Through DLT the digital content and the transactions concerning the trade and exchange of intellectual ownership run efficiently and safe. In addition, many DLT applications by start-ups and online communities facilitate that every type of information is clear and transparent, causing intermediaries such as notaries to become redundant and more and more typical government administration tasks such as land registry to be replaced by public blockchains.

Cryptocurrencies
Meanwhile, ICO's have obtained a negative connotation. Stories about scams and bankruptcies are widely spread. Only a handful of cryptocurrencies are classified as reliable and safe by the European Bank and these are used frequently. Micro transactions payments are now the standard. For example, salaries are paid out and deposited in one's banking account by the minute. In all money transactions, taxes and surcharges are automatically calculated and withheld by the use of smart contracts. The Dutch tax system has changed drastically. Tax declarations are now on the level of transactions and direct profit taxes are based on different tax bases.

Society
The need for a decentralized system that makes it possible to make arrangements and execute transactions with strangers still grows rapidly. DLT offers the solution for making fast and reliable arrangements with strangers without inefficient intervention of third parties. The technology has shown robustness and is widely trusted. There is, however, a downside in the fact that society now expects that everyone manages their (personal) business through DLT. This has caused a gap between the majority of DLT adopters and the digitally weak. Whilst DLT supporters present DLT as infallible, already some painful cases of citizens that lost their formal identity or part of their possessions were disclosed.

Early warning signals:
- Blockchain technology is increasingly developing towards a mature technology due to improvements in the area of energy saving and scalability.
- More countries besides Estonia implement digital citizenship.
- (International) authorities or regulators classify certain cryptocurrencies as safe.

Scenario C: Govchain

Governance
The DLT hype in the late 2010's was a wake-up call for the Dutch government, recognizing that technology affects all aspects of society and the economy. Keeping pace with DLT developments, government opted to retrain her personnel, create field labs and establish collaborations with tech start-ups. The technology has facilitated the streamlining and harmonizing of many of the implementation processes of government. Currently, government mainly opts for permissioned public blockchain applications in which various parties and citizens can participate while maintaining government control. Legislation and regulations in the area of security and privacy are adapted accordingly. Evidence from blockchain and smart contracts is now legally valid.
After years of a more neo-liberal attitude, the last few years has seen government moving toward taking more control over matters to protect its digitally weaker citizens from the (international) tech giants. With DLT enabling more up to date and reliable flows of information, the information position of the authorities has been improved enormously. This political development is largely supported by Dutch society, particularly because trust in the Dutch authorities is many times the trust in commercial multinationals.

Industry
Most of the established parties, like banks and insurance companies, use DLT for internal process optimization or the optimization of the supply chain. Important in this respect is the higher speed of transactions, lower (transaction)costs and higher security that DLT offers. In the Netherlands, there are many permissioned-public blockchain implementations, primarily confined to of the own (supply) chain or sector. For instance, there are different DLT networks for insurances, banking, car lease and energy contracts. Critical opinion holds that that DLT is merely used to automate processes of existing powerful institutions, instead of transforming the current structures.

Cryptocurrencies
Both on the national and the supranational level some successes have been achieved with respect to DLT. The Dutch government has introduced the digi-dime which can be earned, for example, by citizens who engage in community work or apply for a job when unemployed. These digi-dimes can then be exchanged for numerous public services. Social benefits are also paid out in special tokens that can only be spent at designated recipients such as childcare organizations or health insurances in the case of day-care and health benefits respectively.
Following China and the US, the European Union has banned ICO's and new cryptocurrencies since 2023. The EU-coin is the only legitimate virtual coin, which facilitates more efficient and transparent payments between countries. Furthermore it ensures full control over the financial system by the Dutch Central Bank which prohibits tax evasion and illegal transactions.

Society
Because of the pro-active attitude of the government, the societal trust in and acceptation of DLT is large. However, there is a growing group of citizens that worry about the authoritarian policies of the government. They are of the opinion that the government restricts too much of their freedom as a citizen and as a consumer.
Every Dutch citizen has a digital passport which grants access to the digital government systems. This digital identity provided by the government is the only valid identity one may use. In 2021 the first digital national election took place and was a great success. The turnout was higher than ever, the results were 100% reliable and the government could substantially cut back on their costs.
Some of largest law firms employ smart lawyers who are authorized by the government to certificate smart contracts. This certificate attests that the smart contract is verified and satisfies laws and regulations.

Early warning signals:
- More and more countries apply DLT as an answer to fraud and black markets.
- Growing interest of the European Union in DLT and growth of the EU Blockchain Observatory, a forum that was launched in February of 2018.
- Introduction of a pan-European cryptocurrency or VAT-token, or a growing number of countries that introduce a national cryptocurrency.

Scenario D: Beyond the hype

Governance
As far back as 2020, the Dutch government has largely ignored DLT and stopped developing knowledge and investing in DLT innovations. One of the reasons for this restraint is that Dutch top managers did not see the urgency of DLT; they simply did not believe that DLT would have the disruptive that many predicted during the hype. Interest also dwindled because the many cyber-attacks in recent years demanded so many security measures from the government that there was hardly any investment left for innovation. In addition, there were rising concerns about the fact that developments in quantum computing could potentially prove problematic for the robustness and safety of the technology. Over the years, there was also a strong and successful lobby by traditional financial institutions and well organized employers' organizations who considered DLT a threat.

Industry
The lack of interest and support by the government caused uncertainty and reluctance among DLT innovators and users. The reports about the Bitcoin blockchain consuming more energy per year than countries like Croatia or Ireland caused reputation damage in a time when climate change was becoming more visible and serious. Solutions for reducing energy use and improving scalability were not found. Whereas you could attend a blockchain technology related conference every week by the end of the 2010s, DLT is currently laughed off by the same experts that back then were convinced that DLT was the future.

Cryptocurrencies
When in October 2018 the Bitcoin exchange rate dropped from about $25,000 to roughly $2000, the Bitcoin bubble burst. Speculators immediately cashed what was left of their profit, dropping the rate even further to $500 within a week. The Bitcoin crash marked the end of public interest in cryptocurrencies.

Society
A 2020 national referendum backed by a private blockchain application that guaranteed voter anonymity turned out to be traceable afterwards. The leak of votes contributed to the fact that society became even more reluctant to DLT. The many cases of integrity breaches and the worries of the public about privacy and energy consumption were important obstacles to the public adoption and thus eventual maturation of DLT.

Early warning signals:
- Crash of the Bitcoin or other important cryptocurrency.
- The government pays little attention to blockchain technology and does not make any investments.
- Unlike the quantum computer, innovations with respect to blockchain lag behind. The blockchain technology is overtaken by other technologies.

5. Conclusion and discussion

We live in a time where successive technological developments are rapidly sweeping through society, changing for example the way businesses produce value and goods as well as how we interact with one another. Revenue bodies operate in the centre of society and are expected to adapt to these new societal and technological developments, even while at the same time they are facing (financial) constraints and are asked to increase their effectiveness and efficiency. To meet these rising expectations and prepare for a future that is rife with uncertain developments, a strategic planning function is indispensable for modern revenue bodies.

In the current paper, we have presented work demonstrating how one instrument from the toolbox available to strategic decision makers, *explorative scenario planning*, can be applied to facilitate strategic decision making. In the scenario study presented here, we applied the explorative scenario planning method to the topic of DLT (distributed ledger technology, see section 2) and explored the different ways in which technological developments with regard to DLT might impact taxation in 2025. DLT is a technology that promises to disrupt the core of current taxation processes, from the availability and quality of data, to data logistics and the role of (trusted) third parties. At the same time, there currently exist many uncertainties with respect to the ways in which DLT might develop itself as it matures, hampering the assessment of future consequences and opportunities. Such a development, that promises to have a big impact while still being enveloped by uncertainties, is very well suited to the method of explorative scenario planning, in which the most important uncertainties with regard to a certain subject are systematically captured and used to derive a number of distinct future scenarios that form the basis for subsequent strategic discussions and planning efforts.

The research question underlying the scenarios development in the scenario study was focused on the potential impact of DLT on tax-relevant domains in society in 2025. The scenarios were developed using a qualitative approach involving desk research, expert interviews and workshops with DLT experts and an advisory board comprised of NTCA employees from strategically relevant departments within the NTCA. Each of the final four scenarios was constructed using four scenario building blocks representing the most important uncertainties regarding DLT developments from a revenue body perspective. The four final scenarios and their characteristics with respect to the relevant uncertainties are presented in Table 2.

Table 2. Summary of the key characteristics of the four scenarios

	A. Dual Reality	**B. Blocktopia**	**C. Govchain**	**D. Beyond the Hype**
Governance	Government lacks in taking appropriate (legislative) measures and is lagging behind in knowledge	Government creates adequate framework for nurturing technological developments, strong position	Government is an early adopter of DLT. They are pro-active and in control	Government has no sense of urgency, there is a strong lobby against DLT
Industry	Strong investments and development of standards	Small start-ups fuel the DLT revolution	DLT is used for optimizing internal processes and supply chains. Blockchains limited to chain or sector	Reluctance, no solutions to energy use and scalability issues
Cryptocurrency	Not under the responsibility of the authorities, criminal use	Handful of cryptocurrencies are classified as safe, micro transactions	*Digi-dime* and *EU-coin*, controlled by a central authority	Bitcoin crash, no public interest
Society	Negative publicity and limited trust and acceptation	High level of trust, intermediaries are cut out redundant, digital divide	High level of trust and acceptation, some worries about restricted freedom	No public adoption, burst of the Bitcoin-bubble

The main purpose of these scenarios is that they should be used as a tool for facilitating in-depth strategic planning efforts by revenue bodies' strategic decision makers. However, surveying the outcomes in the scenarios we presented, some illustrative observations can be made with respect to the question how DLT may impact taxation. For example, while authorities should not overestimate their influence on the type of emergent innovations to be expected, the chosen approach toward such new technologies when they are still immature may have a noticeable impact on the kind of grip they can expect to have on future developments. For instance, the extent to which authorities provide some kind of regulatory framework or are involved in processes of standardization may lead to a diverse number of outcomes, including outcomes in which further innovations are fostered and outcomes in which a lack of involvement has resulted in a weakening of the information position of the (tax) authorities. It seems important then, whether or not one believes DLT to have a disruptive impact on society, to regularly monitor whether current legislation and regulatory frameworks still adequately cover the most probable scenarios at a given point in time.

Another example of how different outcomes of DLT developments may impact revenue bodies becomes apparent in the variations in the information position that governments have across the scenarios. As mentioned before, the availability and quality of data is of vital importance for today's revenue bodies. Looking at the scenarios, the range in manifestations of

this information position resulting from DLT and other societal developments can be quite broad. In scenario A, government essentially lacks a solid information position, losing sight and control of important revenue streams that fly under the radar because they are embedded in technology the government has no access to. By taking a more active role and shaping the necessary conditions in which DLT technology can develop (scenario B), government may retain a sufficient information position and might even play a key role in authenticating information. Taking this a step further even in scenario C, by having control over the primary applications of DLT, governments may realize a nearly complete position of information. These different outcomes may have big and dissimilar impacts on taxation. For example, in scenario C government may implement a form of full 'no-touch' taxation in which revenue bodies possess all the relevant information and can automatically take of settling tax liabilities. In contrast, in scenario A revenue bodies will probably need to focus their efforts mainly on exploiting the full range of (expensive) instruments and interventions to gather the necessary information for adequate tax collection.

Taken together, all four of the scenarios provide a number of examples of how the different aspects of taxation may be organized in the future, ranging from "business as usual" and not very different from the way they are currently organized in scenario D to increasingly more radical transformations of the tax system in scenario B and scenario C. These examples cover a range of taxation relevant processes and domains, such as customs (valuation), data quality, compliance risk management and tax services.

Importantly, while the final scenarios can be considered as the main physical output of the scenario study, this output is by no means an end in itself. In fact, in explorative scenario planning the scenarios should be considered simply as the basis for facilitating strategic decision making. So, how can scenarios contribute to strategic planning efforts of revenue bodies? First, by thinking through the potential consequences of each scenario for the organization, for tax processes or for tax legislation, strategic decision makers are sensitized to the fact that they operate in a highly uncertain environment in which the course of the future is far from clear. At the same time, this 'rehearsal' of possible futures reduces the perception that the future is merely unfolding in unpredictable ways and provides some grip on handling the various ways in which the future may unfold. Second, if the scenarios are used to generate strategic options for various possible futures, decision makers may make rapid strategic adjustments when the future is perceived to unfold in a certain direction. The early warning signals, of which a few examples were appended to the scenarios presented in section 4, play

an important role in this process. Thinking through which signals influence the odds that (specific components of) a specific scenario might become reality and organizing the systematic tracking and detection of these signals provides strategic decision makers with an important tool to increase their handle on likely developments.

At the core, modern revenue bodies are data processing organizations and, as such, they are vulnerable to disruptive ICT innovations. These innovations are likely to not only effect digitalization of 20th century batch processes, but also to transform current processes and the way in which revenue bodies operate. In our example, three out of four scenarios show a large impact of a specific technology (DLT) on taxation relevant domain in society and therefore urge for strategic evaluation in the board room. To sufficiently prepare for these and other impactful future developments, strategic decision makers should be aware of the instruments that are currently available to provide more grip on an uncertain future.

Acknowledgments

The work presented in this paper was executed by the research department of the Netherlands Tax and Customs Administration, in close collaboration with Dutch research agency Futureconsult. The views presented here reflect the author's views and do not necessary reflect the views of the Netherlands Tax and Customs Administration.

References

Arendsen, R. (2016). Eenvoudig belasting heffen – tussen droom en daad [Simply taxation – between dream and action]. Oration. Retrieved from: http://media.leidenuniv.nl/legacy/oratie-arendsen---drukproef.pdf.

Arendsen, R., Hedde, M.J. ter, Hermsen, H. (2011). Exploring the future of Public-Private eGovernment Service Delivery, in: M. Janssen et al. (eds.), Electronic Government, LNCS 6846, Heidelberg: Springer, pp. 441-452.

Ben Allouch, S. (2016). Van adoptie naar acceptatie van nieuwe technologie [From adoption to acceptation of new technology]. Lectoral speech. Retrieved from: https://www.saxion.nl/wps/wcm/connect/f3e64281-5d33-4dae-9f97-417f4de29941/Lectorale+rede+Somaya+Ben+Allouch.pdf?MOD=AJPERES

Brynjolfsson, E. & McAfee, A. (2014). *The second machine age: Work, progress and prosperity in a time of brilliant technologies*. W.W. Norton & Company.

Christensen, C.M. (1997). *The innovator's dilemma: When new technologies cause great firms to fail.* Boston, Massachusetts: Harvard Business School Press.

Cuhls, K. (2003). From forecasting to foresight processes – new participative foresight activities in Germany. *Journal of Forecasting, 22*, 93 – 111.

Dutch Blockchain Coalition. (2017). *Smart contracts as a specific application of blockchain technology*. Smart Contract Working Group.

Fabregas, M.T. (2017). Blockchain technology: why does it matter for tax administrations? In *Disruptive business models – challenges and opportunities for tax administrations*, Intra-European Organization of Tax Administrations (IOTA), Budapest, 2017.

Hanson, R.T., Reesson A., & Staples M. (2017). *Distributed ledgers: Scenarios for the Australian economy over the coming decades.* Commonwealth Scientific and Industrial Research Organisation.

HMRC (2015). *Making Tax Digital – Roadmap*.

IMF (2017). *Digital revolutions in public finance*.

OECD (2016). *Technologies for better tax administration*. Paris: OECD Publishing.

OECD (2018). *Tax Challenges Arising from Digitalization – Interim Report 2018: Inclusive Framework on BEPS.* Paris: OECD Publishing.

Maclaine Pont, P., van Est, R. & Deuten, J. (2016). Met beleid vormgeven aan socio-technische innovatie [shaping socio-technological innovation with care]. The Hague: Rathenau Institute.

Nekkers, J. (2011). Wijzer in de toekomst; werken met toekomstscenarios [Smarter in the future: Working with future scenarios]. Amsterdam: Business Contact.

Regan, D. (2017). Tax administration in the age of blockchain. In *Disruptive business models – challenges and opportunities for tax administrations,* IOTA, 2017.

Sim, T., Owens, J., Petruzzi, R., Tavares, R.J.S., & Migai, C. (2016). Blockchain, transfer pricing, custom valuations and indirect taxes: The potential of the "trust protocol" to transform the global tax environment. Institute for Austrian and International Tax Law, Vienna University of Business and Economics.

Tapscott D. & Tapscott. A. (2016). *Blockchain revolution: How the technology behind bitcoin is changing money, business and the world*. Portfolio/Penguin.

UK House of Lords (2016). *Distributed ledger technologies for public good: leadership, collaboration and innovation*.

Van der Heijden, K. (1996). *Scenarios: The art of strategic conversation.* John Wiley & Sons.

WEF (2016). Davos.

WU Global Tax Policy Center (2017). Blockchain 101 for governments. Institute for Austrian and International Tax Law, Vienna University of Business and Economics.