# **Regulating and taxing platform businesses** An innovative blockchain solution for personal transportation in Denmark



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# Regulating and taxing platform businesses

An innovative blockchain solution for personal transportation in Denmark.

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# Abstract

The platform economy has been on the rise for years with innovative companies like Airbnb and Uber disrupting traditional industries. Yet in 2018, the Danish legislation and taxation system are inadequate to facilitate growth and innovation in this part of the economy. To better illustrate the need for improvements, we use Uber and the personal transportation sector in Denmark as an example case.

Design science research methodology was used throughout the entire research. First, we built a knowledge base to better understand the problem, stakeholders and possible solutions. Afterwards, a blockchain-based conceptual model was created to address the tax reporting problems of producing users of platform businesses, in particular Uber drivers. The initial model was shown to the most important stakeholders for evaluation. Finally, the gathered feedback was used to create both a revised blockchain-based and API-based model. The accompanying recommendations and discussion of both models are valuable for anyone dealing with the future of taxation.

Our novel blockchain focus entailed that we immutably linked financial and information flows. This unique focus makes this research particularly helpful for governments and tax authorities looking to leapfrog their taxation policies and infrastructure.

**Keywords**: Platform business models, platform economy, taxation, tax policy reform, labour platforms, capital platforms, Uber, Lyft, Airbnb, legislation, public sector, innovation, personal transportation, taxi industry, fintech, blockchain, Hyperledger, API

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# Introduction and problem formulation

During the last century, the economy has steadily been shifting from products to services. Services are nowadays even becoming a prominent part of the international trade (OECD, 2018). The combination of more computational power, big data, and ease of communication has led to new kinds of economic interaction that challenge old industries, conceptions about employment and what it means to be a consumer or a producer. These new kinds of commercial transactions are often referred to as the sharing economy, app economy or platform economy. Uber is a well-known platform company that became an overnight success due to its ease of use for both drivers and passengers combined with lower prices compared to taxis.

Many platforms face opposition from traditional companies. Uber itself has halted its original business idea UberPOP in many countries, due to the existing personal transportation legislation focusing on traditional taxis. In Denmark, Uber finally threw in the towel by ceasing operations in April 2017 (Uber, 2017a).

To make matters worse, a group of Uber drivers was fined by the Copenhagen City Court for being in breach of the taxi legislation. The biggest fine issued to a driver was 486.500 DKK (Københavns Byret, 2017).

The recent taxi law changes illustrate that Uber and similar companies are purposefully being kept out of the Danish personal transportation market. This is purely a political choice, partly due to the outcry by the traditional taxi industry. Taxation is a different matter that needs a better technological solution. A recent article indicates that out of the 1.195 Uber drivers investigated, only 3 drivers filed their income correctly, with an average outstanding debt of 9.400 DKK (Christensen, 2018).

These drastic events and statistics coupled with the documents produced by scholars and the government about innovative solutions to taxation problems (Erhvervsministeriet, 2017; Ilsøe & Madsen, 2017; Skatteministeriet, 2017), were the primary motivators for us to pursue a solution for Uber and other platform businesses in Denmark.

We opted to pursue a solution based on blockchain technology due to its speed, safety, transparency and security. In theory, the new solution would make the current taxation system faster and more accurate. Instead of burdening the producing users, it would facilitate them. However, such a system can be built in different ways. As a first step, a high-level conceptual model is required to present to the involved stakeholders for a feasibility analysis. As part of the overall feasibility analysis, we address three important perspectives: technical, political-legal and business feasibility.

# Research question

Based on our aim to assess the feasibility of a blockchain-based taxation solution, the following research question will be used:

How to design a blockchain solution for platform businesses that would solve the taxation problem with producing users?

A general solution will be suggested that addresses the taxation issue for most platform businesses. But to make the project more focused and easier to understand, we use Uber and the personal transportation industry in Denmark as a case study.

# Scope and limitations

As far as the term platform business goes, it is quite a universal term with different possible business models (Boudreau & Lakhani, 2009; Parker et al., 2016). This thesis focuses on twosided platform businesses that link a producing user to a consuming user. Platforms are often built on the same technical foundations, but subject to different legal frameworks. This is one of the main reasons for us to focus on the general taxation issue as opposed to the industry-specific legislation.

The term personal transportation can also be interpreted broadly; a person can be transported by any means of transport. In our context, we refer to commercial personal transportation by car. The term was chosen as a means to open up this particular market, which up until a few years ago was reserved for taxis.

Using only the personal transportation industry as an application domain allows us to go indepth to illustrate why this research is so relevant to society. Where possible, we also refer to other platforms to illustrate the overall problem and need for an general solution. We hope to ensure reliability by interviewing both the most relevant general stakeholders and casespecific stakeholders.

Similarly, we acknowledge that this problem also persists outside of Denmark, but developing an international solution would lead to a loss of detail and could simply be impossible considering widely varying national legislation. Instead, we are paving the way for a Danish pilot project and future overarching research. In our literature review, we will also discuss how other countries are handling similar problems, but ultimately the focus is to improve the situation in Denmark.

Although a crucial matter, corporate taxation is not extensively discussed in this thesis. Corporate taxation is ultimately a non-platform specific transnational problem that could be analysed in another study.

# **Overall structure**

The first sections concern the used methodology and literature review. In short, the literature review discusses two-sided platform businesses, taxation issues, innovation and blockchain technology. Detailed feedback from the interviewees on the conceptual model is presented afterwards. Based on the feedback, a revised stakeholder map and conceptual models were constructed. We conclude with a discussion of the findings, conclusion and future research suggestions.

# Methodology and theoretical framework

We used several theoretical frameworks as part of our overall methodology. Below is a detailed discussion followed by a summary at the end of this section.

# Case study design

This thesis is based on a case study research within the personal transportation sector in Denmark. The overarching goal is to investigate how blockchain technology can be used to design a solution for the platform business taxation problem in Denmark regarding producing users. In order to achieve this, we assess the different types of feasibility of a proposed high-level blockchain design:

- technical feasibility
- political-legal feasibility
- business feasibility

Case study research is ideally suited to answer how and why questions, especially in a setting where researchers have no control of behavioural events. There is also a strong focus on contemporary events with case studies (Yin, 2003).

# Single-case embedded design

Case study research can be carried out in different ways, it can be done holistically with a single unit of analysis, or it can be done embedded with multiple units of analysis. Besides this choice, one can also opt to research not just a single case but to replicate the research across multiple cases to increase the external validity and generalisability of the findings (Yin, 2003).

In choosing amongst the different variations, it is first useful to both zoom in and out to our unit of analysis. When zooming out, most two-sided platform businesses facilitate transactions between producing and consuming users. They are interesting to study because the findings could be generalisable to all of them.

Secondly, Yin (2003) mentions that a rationale for choosing a specific single-case can be uniqueness or extremeness. In our example, the controversy, lobbying, years of delay in taxation, the height of the fines, etc. all make this case very interesting to study.

The remaining choice to be made is between a holistic and an embedded case study. Considering the topic revolves around the personal transportation sector in Denmark, a lot of distinct stakeholder groups are relevant. All these stakeholder groups function as units of analysis in an embedded design. The challenge in this particular case study research is reliably measuring these units of analysis at the organisational level.

In contemporary case study research, it is possible to focus on the actions of the organisation. However, there will be no organisational actions as our topic is about future policy and technical implementation. Only historical actions can be assessed as a guideline for future actions. Special care needs to be taken so that the units of observation during data collection, namely the interviewees, represent an opinion that is representative for the unit of analysis, namely the organisation they work for. In addition, as our case is future-oriented, the reader should bear in mind that even a representative opinion could no longer be of significance if the organisation changes its stance after conducting the research.

# Design science research

When reading the case study literature by Yin (2003) and Bryman (2017), one cannot avoid the strong sociological tone; there is a strong focus on examining contemporary social phenomena. The focus of traditional academic literature is often on theory development and hypothesis testing. This thesis is more focused on investigating and designing a future solution to a real-world problem. As part of the overall feasibility analysis, we address three critical perspectives or study propositions as Yin (2003) would call them: technical, politicallegal and business feasibility. Because of the different focus, we expanded our knowledge of academic methodological literature with a number of readings on design science research (DSR) (Beck, Weber, & Gregory, 2013; Gregor & Hevner, 2013; A. Hevner & Chatterjee, 2012; A. R. Hevner, Ram, March, & Park, 2004; Hyvärinen, Risius, & Friis, 2017; Nærland, Müllerbloch, Beck, & Palmund, 2017; Weedman, 2008).

Part of the literature was general, while the other part was blockchain specific. Especially in the general literature, it is remarkable to see how DSR coincides with a vast array of other disciplines, of which information systems research, design science and behavioural science, and organisational science are most prominent. Alan Hevner, one of the leading scholars in DSR, also mentions the case study explicitly as a design evaluation method (Hevner et al., 2004). This further substantiates our choice for using a combination of case study and design science research. The mentality and some of the methods behind academic DSR are comparable to the more business-focused participatory design as described by Ramaswamy & Gouillart (2010). The precise methods used in DSR literature vary, there is no consensus as to which exact approach should be followed. However, many elements do reoccur, and a useful selection is represented further on.

Before going into more detail about the component of DSR, we will provide a brief explanation for the unfamiliar reader. Starting with a definition:

"Design science research is a research paradigm in which a designer answers questions relevant to human problems via the creation of innovative artifacts, thereby contributing new knowledge to the body of scientific evidence. The designed artifacts are both useful and fundamental in understanding that problem." (Hevner & Chatterjee, 2012, p. 5)

DSR is broadly used for two purposes: (1) problem solving with an artifact as a result and (2) contributing to the knowledge base by generating theory. The term artifact is broad and can refer to constructs, models, methods, instantiations and improved design theories (Hevner & Chatterjee, 2012). The focus here will be on models, which are abstractions and representations of a future solution, as a first step to create a future instantiation that would take the form of an IT system.

#### DSR cycles

An essential element of doing DSR are the iterative cycles, in this regard, there is a resemblance with the commonly known AGILE approaches in software engineering. The relevance cycle in Figure 1 covers the application domain; good DSR often begins with the relevance cycle that identifies a problem area and an opportunity to solve it. One also needs to determine the evaluation criteria for the artifact. Does the artifact provide an improvement? Does it solve the problem?



Figure 1: DSR cycles. Copied from Hevner & Chatterjee (2012, p. 20)

The rigor cycle connects the design activities with the existing knowledge in the form of theories, methods, experience, expertise, and meta-artifacts. The design cycle stands in the centre with the iterative activity of building and evaluating the artifact (Hevner & Chatterjee, 2012). Furthermore, the environment provides the business needs for DSR, while the knowledge base adds rigor to the DSR process. DSR helps to make informed decisions in the environment and adds information to the knowledge base (Hevner et al., 2004)

To illustrate the approach for the reader, and as a guideline for doing the actual research, Table 1 below lists a set of questions that researchers should ask when applying DSR.

Questions	Answers	
1. What is the research question (design requirements)?	How to design a blockchain solution for platform businesses that would solve the taxation problem with producing users?	
2. What is the artifact? How is the artifact represented?	The artifact is a high-level conceptual model. The model is represented to each interviewee before the interview accompanied with a description.	

 Table 1: DSR cycles - stepwise checklist, adapted from (Hevner & Chatterjee, 2012, p. 20)

3. What design processes (search heuristics) will be used to build the artifact?	The initial conceptual model will be based on the knowledge base consisting out of a literature review, the experience and expertise of the authors. Subsequently, the conceptual model will be tested in the environment by gathering feedback from stakeholders. Based on this feedback, a revised conceptual model will be presented.
4. How are the artifact and the design processes grounded by the knowledge base? What, if any, theories support the artifact design and the design process?	<ul> <li>The knowledge base used to create the initial conceptual model is composed of different sources:</li> <li>Professional experience by the authors</li> <li>Previous research proposal (Warnez, 2017)</li> <li>Latent, tacit and explicit knowledge by the authors</li> <li>Literature review presented in this thesis</li> </ul>
5. What evaluations are performed during the internal design cycles? What design improvements are identified during each design cycle?	The goal is to evaluate the feasibility of using blockchain technology to solve the taxation issues with the producing users of platform businesses in Denmark. A strong focus is given to the personal transportation sector, with Uber as an example case.
	The feasibility of the conceptual model is assessed by interviewing stakeholders and experts. The assessment is done from three different perspectives: • technical feasibility • political-legal feasibility • business feasibility Overall feasibility is determined by clearing all three sub assessments. The feedback is discussed and a revised conceptual model is presented at the end of this thesis.
6. How is the artifact introduced into the application environment and how is it field tested? What metrics are used	The conceptual model is introduced to stakeholders to get their feedback from the three feasibility perspectives. An actual prototype construction is only warranted after
to demonstrate artifact utility and improvement over previous artifacts?	passing all three parts of the feasibility study. Provided this would be the case, a simple prototype could be constructed as proof of concept.
7. What new knowledge is added to the knowledge base and in what form (e.g., peer-	The findings with their practical and theoretical relevance are discussed at the end of this document.
reviewed literature, meta- artifacts, new theory, new method)?	Using blockchain in the public sector is a new research domain, especially for taxation purposes. The findings provide valuable insights for future work and research.
8. Has the research question been satisfactorily addressed?	We believe so to the extent possible within the scope of a business school master thesis.



Figure 2: General design cycle of DSR. Copied from Beck et al. (2013) and Kuechler & Vaishnavi (2008)

The introductory parts of this thesis focused on explaining the problem awareness step in Figure 2.

As mentioned in the Table 1, the precise goal of the thesis is to create a high-level conceptual model of a blockchain solution. This model maps the financial interactions between stakeholders in a suggested blockchain solution. One can regard such a conceptual model as a tentative design in the broader design process, or as an artifact when focusing on development in the design cycle.

Besides merely creating the model based on knowledge gathered from the DSR knowledge base, we will also present the model to different stakeholders to gather feedback. This feedback will be used to evaluate the technical, political-legal and business feasibility.

# Participatory Design with focus on stakeholders

The Danish Ministry of Industry, Business and Financial Affairs (Erhvervsministeriet) recently released a document on how the Danish economy could grow and profit from the sharing economy (Erhvervsministeriet, 2017). However, the proposal on how to register revenue gained through platform businesses was vague and included no concrete suggestions beyond starting a dialogue with platform businesses and payment system providers such as NETS for Dankort/VISA and Danske Bank for MobilePay.

Although Erhvervsministeriet was quite unclear in their report, having a dialogue as a starting point as opposed to an undiscussable model does have its merits. Especially when a solution requires powerful stakeholders with different interests to cooperate. Active cooperation, or compliance at the minimum, is needed during development, implementation and daily use of a proposed solution. For these reasons we have taken some co-creation elements and focus points from participatory design (PD).

The co-creation approach by Ramaswamy & Gouillart (2010) is of particular interests with their practical approach consisting of these four components:

- Stakeholder identification
- Understanding and mapping stakeholder reactions
- Bringing stakeholders together in workshops
- Platform building

Identifying stakeholders and gathering their feedback for evaluation purposes is a shared characteristic with DSR. Though PD puts a stronger focus on involving stakeholders in the entire process and stimulating continuous interaction. PD's spotlight on stakeholders derives from its co-creation approach with businesses and customers, as opposed to the more academic audience with DSR. It would be naive to copy all attributes of this approach to a new financial ecosystem design.

Keeping all stakeholders satisfied in a complex system could easily prove to be impossible, and participation in a solution would then require compliance through legal regulation by the state. The core idea of PD is to create value, through which it incentivises stakeholders to participate. On the other hand, the essential part of DSR is to set goals and design a solution that meets those goals. The goal setting itself at the start of the process is in that sense also flexible and can change along with an emerging strategy and implementation.

# Chosen approach

The methodology sections up to this point have illustrated the chosen theoretical background. We use a mixture of different methods where single-case study embedded design provides the overall background. We chose the personal transportation sector in Denmark as the single case, with an embedded focus consisting of multiple units of analysis (stakeholders). Design science research helps to illustrate our more specific research approach together with participatory design. We go beyond the default questions of 'why' or 'what' needs to change. Instead, our strategy is to focus on building and evaluating a possible solution that benefits most stakeholders. We considered doing an intensive version of design science research as shown in Table 2 below but refrained from explicitly doing so due to time constraints. Nonetheless, feedback from past interviews was used to finetune and investigate certain topics further in ensuing interviews.

Basic case study research	Design science research	Design science research - intensive
<ol> <li>Design model</li> <li>Do interviews</li> <li>Discuss feedback</li> </ol>	<ol> <li>Literature review</li> <li>Design model</li> <li>Do interviews</li> <li>Discuss feedback</li> <li>Present revised model to be investigated further in future research</li> </ol>	<ol> <li>Literature review</li> <li>Design model</li> <li>Do interviews, but also continuously process feedback and present updated model at each new interview</li> <li>Discuss feedback</li> <li>Present revised model to be investigated further in future research</li> </ol>

#### Table 2: Overview of different considered approaches

# Data collection

This study is based on two types of data collection. We cover desk research in our literature review, which provided the necessary inputs for field research. Various blog posts and articles from relevant actors were also used when necessary to emphasise a point or when not enough information could be gathered from academic literature or the interviews. After the literature review, we started field research in the form of interviews with relevant stakeholders. This approach provided the necessary data to analyse the research question and reach a valid conclusion.

The following section is an interview guide we used to reach a result that would be valid and reliable for the conclusion of this study.

#### Interviews

Most of the field research were interviews conducted with stakeholders and experts in the field. We approached various players to assess the feasibility of the conceptual model. We were interested in assessing the feasibility from different angles:

- Technical feasibility: is the proposed conceptual model implementable from a purely technical perspective? To evaluate this, we needed to validate our assumptions with at least one blockchain expert. Besides mere validation, this expert can also share insights that can help to refine the model further.
- Political-legal feasibility: can the proposed model be approved by politicians into a binding legal framework? Are there any unforeseen legal issues that need to be taken into consideration? For this, we needed someone who is currently or has been recently an active part of the Danish political sphere.
- Business feasibility: would platform businesses remain active under these new reporting requirements suggested by the conceptual model? We expected to get insights into this from most interviewees, but also aimed to interview Uber, the case we used for analysis.

#### Interview structure

To structure the interviews, we used the checklist provided by Arksey and Knight (1999), where they point out the standard guidelines to ensure a proper way to conduct an interview,

so it would be worthwhile for both parties and the outcome would be consistent, truthful and considerate. For example, particular attention was paid to distinguish the opinion of the interviewee with that of the overarching organisation. Another point describes the need for streamlining the interpretation of the interviews; there are many ways to understand a sentence and the meaning must stay reliably unified.

Furthermore, it is essential to ensure a level of generalisability. As the data collection will not involve a random selection, a more analytical generalisation method will be used. Analytical generalisation implies that the results from one study can be used as a guide to what might occur in other situations (Kvale, 1996). The soundness of the claims being made will have to be judged by the reader, as we reason for our findings.

We did an exploratory interview with Dansk Taxi Råd, that represents the interests of taxi companies and taxi license holders, on 7 September 2017. The information gathered helped us to get a better feeling of the dynamics of the industry and formulate a thesis proposal.

Interviews done in 2018 were of a semi-structured nature, where we asked two kinds of questions: general ones that were repeated across all interviews, and stakeholder-specific questions. We sent the questions in advance but allowed ourselves to steer from the pre-made questions if further insights into to the matter arose during the interview. The questions, together with an introduction and walkthrough of the conceptual model, served as a preparation for the interviewee to better be able to answer the actual questions during the interview.

# Interview style

The interview questions are a mix of various styles, for example, an indirect question like "In which direction do you see the personal transportation industry evolving in the upcoming years?", but at the same time with more direct probing questions like "In the plan, point 6 shows particular interest in starting a dialogue and building a system around digital platforms and payment service providers for better revenue and tax registration. What is your organisation's stance on this?" This type of mixed approach is necessary as there are more

than one value criteria for the interviews, and stakeholders have been chosen based on their specific knowledge and involvement in various spheres.

As an overarching theme, the purpose of the interviews were to explore the subject area indepth. The problem has been narrowed down, and instead of investigating wider with other possibilities, we will uncover the valuable info that various experts might have. Taking a goldminer-like logic (Kvale, 1996) allows us to seek nuggets of essential knowledge. Kvale points out that this approach allows for more objective and purified transcription of facts that provide a more authentic truth.

Organisation or general expertise	Interviewee title	Focus	Relation to thesis	Interview date	Interaction
Dansk Taxi Råd	Public relations representative	Political- legal Business	Covers 75% of the taxis in Denmark	2017-09-07 2018-05-01	Face-to-face Phone
ІВМ СІС	Blockchain consultant	Technical Business	IBM is a major contributor to the Hyperledger project	2018-02-23	Face-to-face
Open banking expert (Ernit)	Vice president of engineering	Technical Business	Open banking expert with experience in PSD2	2018-02-24	Face-to-face
Uber	Public policy representative	Business	Representative in charge of Norway and Denmark	2018-03-01	Face-to-face
Danish political expert (Liberal Alliance)	Former executive board member	Political- legal	Danish political expert with blockchain knowledge.	2018-03-05	Face-to-face
SKAT	Blockchain developer & Interaction designer	Technical Political- legal	Employees of the Danish tax authority with technical insights	2018-03-22	Face-to-face
Aryze	CEO & CFO	Technical Business	Start-up aiming to offer e-kroner payment solutions	2018-03-22	Face-to-face

#### Table 3: Overview of interviews

MobilePay	Chief Consultant	Technical Business	Pioneer in Danish mobile payment solutions. Former employee of Danske bank	2018-04-04	Face-to-face
Meploy	CEO	Political- legal Business	App-based labour platform	2018-04-04	Phone

We understand that we open ourselves up to the problem of lack of triangulation (Arksey & Knight, 1999), meaning we only use one method as our primary data collection. We would argue though that although triangulation provides a fuller picture, it does not necessarily give a more objective one. For this study, accuracy is far more important than range.



*Figure 3: Meaning as the intersection of four fields. Copied from Arksey & Knight (1999)* 

We aim to reach a satisfactory level of triangulation by using a within-method methodological triangulation (Arksey & Knight, 1999). Meaning that we strive to cover as many of the different sides of the stakeholder map as possible. The method might stay the same, but every interview had a unique purpose to it - finding a point of view from different sides: technical, political-legal, business. In every interview we took turns asking most of the questions while the other author takes notes. This alternation helps to remove bias from a single interviewer and provided ground for

better discussion towards a more neutral interpretation by the authors.

To ensure credibility, primary social research needs to be fortified by other sources. It was the collaboration of the interviews, our understanding of them, the literature and the used research design that shape the meaning that provided value to the project.

To summarise, nine interviews were conducted. These interviews cover the majority of the relevant stakeholders and provide us with insights to the feasibility of the conceptual model from the three different perspectives. To ensure the quality of our interviews, we used suggestions from Arksey and Knight (1999) and Kvale (1996) and where an interview was not possible, we used research and articles made by relevant entities.

# Literature review

The literature review functions as part of the knowledge base from which one bases a design upon in the discussed DSR methodology. There is a fair number of articles, books and research about blockchain technologies and how they can disrupt various industries. However, there is no one study to follow and build upon for the specific question addressed in this study. Therefore, the literature review below investigates different concepts revolving around designing a solution to our chosen problem.

The literature review holds five focus points: 1) to introduce the reader to platform businesses and issues surrounding them, 2) to get a better understanding on how innovation happens on a governmental level, 3) to delve into recent innovation surrounding banking, 4) to understand what are the legal obstacles that our solution might face and 5) to understand existing innovation in blockchain technology.

# Two-sided platform business

The general term platform business can be used in different ways. Boudreau & Lakhani (2009) made a typology discussing three different types of platform business models, namely Integrator Platform, Product Platform and Two-sided Platform. They are distinguishable on an axis indicating how much control the platform and external parties have. Besides control, the position of the platform in the economic interaction is also quite different.

An Integrator Platform places itself between an external innovator and customers, the Apple and Android smartphone app stores are known examples connecting app developers with the customer. A Product Platform is used by external innovators as a foundation layer to provide an end product to the customer, Amazon, Google and IBM with their cloud computing services are well-known examples. The third category Two-sided Platform is of most interest in this thesis.

Two-sided platforms, with this type of platform the external innovator and customer communicate directly with each other. However, the interaction is only made possible by platform providing the initial connection. Two-sided platforms are thoroughly discussed by Parker, Van Alstyne, & Choudary (2016). The two most well-known examples in Denmark are Uber and Airbnb. These companies will be used as illustrative examples throughout this thesis. A particular focus is given to Uber considering its special nature and history in Denmark.

Further discussion of platform companies will solely focus on the two-sided platform business model. This particular model is interesting because it turns the conventional understanding of how businesses work upside down and even disrupts the understanding of who the producers and consumers are. As shown in Figure 4, the platform company by itself does not provide the service. The platform company merely facilitates the interaction between different user groups and take a commission on deal completion.



3. Provides service

*Figure 4: Basic interaction model of most common two-sided platform companies* 

#### Different business and economic dynamics

A two-sided platform typically has no real physical assets compared to its incumbent opponent. Airbnb owns no rooms and Uber owns no cars. The same logic goes for employees, a platform company may still have a lot of IT developers and staff for support functions, but the core service is not provided by internal staff. Instead, the core service is provided by external producing platform users. On the incumbent side, traditional hotels and taxi companies still have a lot of employees on the payroll that take care of the core service provisioning. These differences lead to platform businesses being able to scale more efficiently and faster compared to their traditional counterparts. For example, a new hotel building might need half a decade to materialise while new Airbnb room listings require little or no effort by Airbnb. This change in time frames also has its implications on the cost structure of companies and the economy in general. Platform businesses have not just externalised the cost of production; they also tend to make use of underutilised economic resources such as space, equipment and time. By doing so, they can often profit from existing infrastructure that only comes at a little additional financial cost for the producing users and the platform. Making better use of existing economic resources tends to also be better for the environment.

#### Labour vs capital platforms

The producing user does not necessarily need to be self-employed, that depends on the specific platform business and how the user receives revenue. One should know that there are two very different types of platforms. There is the labour platform type, known examples are Uber, Lyft, Upwork, Meploy, Happy Helper, etc. But there is also the capital platform type, known examples are Airbnb and GoMore. The difference is important to distinguish as although both types are platform businesses, and share many of the same characteristics, they are treated quite differently.

To illustrate with the example of Airbnb and Uber. Airbnb is a capital platform, where the producing user merely offers the guests to make use of a vacant room. Uber is a labour platform, where the producing user actually has to work to earn money. This distinguishment entails entirely different sets of labour or capital legislation, social contributions, social benefits, taxation rates, and tax-free amounts. Furthermore, a mixed area is developing with platforms offering services that can be classified as capital income and labour income, for example Airbnb offering rooms and tour guiding (Ilsøe & Madsen, 2017). Taxing the income statements received from platform businesses correctly thus requires the Danish tax authority SKAT to have an in-depth overview of which specific services have been performed at specific times in order to correctly attribute earnings.

# Taxing the producing user

# Taxations problem with Uber drivers in Denmark

Before elaborating further on how to address taxation, we will illustrate the gravity of the root problem of taxing the producing user of a platform company. For this, Warnez (2017, p. 5) writes a good recap of the case:

"... the self-reported taxes, or lack thereof, by Uber drivers have only been checked for 2014 and 2015. The Danish tax authorities are reliant on the willingness of the Dutch tax authorities to also hand over information for 2016 and 2017. A problematic matter as Uber drivers were not just taxed but also severely fined for being illegal taxi drivers. Some of the fines are so large that one wonders if the intent was to set examples by bankrupting the circa two thousand Uber drivers. The biggest fine issued was 486500 DKK (Københavns Byret, 2017)."

Putting an exact percentage on the lack of or incorrect tax reporting is not easy. DR (2017) reported that SKAT sent 641 additional tax bills. These were based on the Excel file by the Dutch tax authorities. Considering the total number of drivers in the Excel file and the nuances with actual active drivers and a minimum earned amount (Børsen, 2017a), a ballpark guess of 30% would be reasonable. However, another more recent new article (Christensen, 2018), accompanied by a video statement of tax minister Karsten Lauritzen indicates that SKAT has now investigated 1.195 drivers and only three drivers were fully in order. In other words, 99% did not report their taxes correctly or not at all, with an average outstanding debt to SKAT of 9.400 DKK.

# Perfect storm: expense deduction, company registration, accounting and VAT

An individual does not need a company to deduct expenses as this is also possible with the Bincome system in Denmark. Although not stated by Christensen (2018), a possible explanation for the misreporting could be in the way how income is calculated: income is revenue minus deductible expenses. Considering that Uber was never legal in Denmark, no clear state guidelines to which extent certain expenses could be deducted. It is also somewhat unreasonable to expect producing users to by themselves figure out which complex set of taxation and deduction rules apply, especially in the context of an illegal Uber in Denmark. The responsibility for accounting revenue and deductible expenses is challenging. Accounting is a task too specialised for low-income workers and at the same time too expensive to outsource to a specialised accountant.

To complicate matters even further, Danish law requires that individuals register a company if they expect to have a revenue flow of 50.000 DKK or more within a running period of 12 months. A company is expected to pay Value-added tax (VAT) or meromsætningsafgift (MOMS) as it is referred to in Denmark. Though transportation services are by themselves exempted from VAT in Denmark (SKAT, 2017b).

Above paragraphs illustrate that most simple producing users cannot and thus should not be troubled with complicated full-scale accounting and self-reporting to SKAT.

# Paying back unrightfully received social benefits

Christensen (2018) also writes that 75% of the drivers received social benefits during their income year, which could be problematic considering that at least a part of unemployment benefits in Denmark have to be paid back when simultaneously working as an Uber driver. This example illustrates the need for the Danish government to commission a system where not only earnings are reported, but also when exactly the work was performed and how much time was spent on it. Avoiding unrightfully received social benefits is also essential to sustain a fair marketplace. Having a platform business that de facto relies on welfare state subsidised employees is unfair competition.

#### Tax-free amounts and tax rates

From a personal taxation point of view, there is a definite discrepancy between how earnings are taxed from labour platforms and capital platforms. It is quite remarkable to see how capital platforms, and the richer classes of producing users using them (Ilsøe & Madsen, 2017), are financially favoured by both current and future legislation suggestions (Erhvervsministeriet, 2017).

Uber is a labour platform and thus taxed as personal labour income. Labour income, excluding labour market contribution (AM-bidrag) of 8 percent, is theoretically not fully taxed until exceeding 75.000 DKK when considering the personal income tax free amount of of 45.000 DKK and employment deductions up to 30.000 DKK in 2017 (SKAT, 2017a). In reality, a lot of people will have already used this tax-free amount with other employment or even social benefits. The de facto result is that working extra for a labour platform leads to a heavy tax burden.

Using a capital platform easily leads to paying no additional tax at all. Renting out on Airbnb currently leads up to at least 24.000 DKK extra tax-free capital income (SKAT, 2018). The government plans to increase this even further judging by point 6 in the government's plan for the platform economy (Erhvervsministeriet, 2017, p. 46). A tax-free amount of 36.000 DKK would be granted for renting out a summer house and permanent residence, and 5.000 DKK for cars and boats. Though, under the condition that a third party such as a platform company reports the earnings to SKAT. This condition suggests that the government intends to nudge international companies in compliance by incentivising the producing user base of capital platform companies to choose for a compliant platform company.

# Lack of employment, social contributions & benefits

One thing that makes labour platforms very hard to regulate is also one of the founding principles of it: a labour platform like Uber does not employ the producing user. From a social point of view, there are a lot of issues for the producing user. For starters, what should the legal status of the producing user be under different circumstances? The current Danish system of B-income (B-indkomst) is suitable enough for those that work extra on the side of their primary employment, but uncertainties and problems arise in most other scenarios.

Let's take the example of a full-time Uber driver. Uber drivers that decide to create a single person owned company are self-employed, but that is a matter up for discussion with rules about false self-employment. As opposed to regular employees, there is no compensation when they are sick or take a vacation. There is also no obligatory pension fund contribution either, resulting in financial issues later in life. The lack of benefits and an hourly wage makes the flexible producing users cheaper for a platform business to the point where one can consider it social dumping. That on its turn is a competitive disadvantage for the incumbent traditional industries that experience more pressure to push down wages of their employees to compete with these new platform businesses.

#### Overall taxation assessment

The overall Uber case illustrates the need for solutions and better user facilitation, in particular for taxation. SKAT can currently not enforce the handover of information when the platform company has a legal headquarters outside of Denmark. The need for a solution on this matter is commonly recognised by scholars and the government (Erhvervsministeriet, 2017; Ilsøe & Madsen, 2017; Skatteministeriet, 2017).

The more complex, yet less visible and discussed issue is, that SKAT actually needs to know the details of the economic activity underlying a producing user's financial flow originating from platform activity. This is needed to attribute earnings correctly in the right tax categories and tax accurately. Detailed information is also needed to prevent users from unrightfully receiving social benefits.

The debate on how producing users of labour platform should be dealt with from an employment perspective is a complex one with many political angles. An easy left-wing solution would be to use the A-income system with regular employment, with an added system for simplified expense reporting. That would pretty much solve most issues just discussed. However, this becomes less realistic when dealing with international companies not having a legal presence in Denmark.

Traditionally employing people is a very local and complicated matter for global companies aiming to scale, not just from a labour cost point of view, but also regarding administration, IT infrastructure, legal advice, etc. Perhaps a new flexible employment category is needed for producing users that facilitates both them and the platform company. To preserve the Danish political viewpoints and uphold a fair market competition, producing users could still pay social contributions and build up social benefits similar to an employee. In regard to the platform business, they should be provided with an easy way of reporting and paying the producing user without overloading the company with administrative tasks.

# Innovation and compliance

Innovation is a broad term interpretable in many ways. As often with broad terms, there is no one unified definition for innovation. Instead, we narrowed the research and found an example from Schumpeter's (1942) research about governmental innovation. In his research, he discusses how innovation tends to arise in two ways after compliance burdens are set by governments. Either companies are strong enough to cope with the burden and grow their products in accordance to the new regulation, or if the regulations cannot be met, firms will try to use circumventive innovation to break the burden and still keep the business running.

Schumpeter's research implies that a simple compliance burden would be harmful to the companies as it forces them to increase their costs and some firms might not even survive the change. But if the regulations induce a compliance innovation, there is a high chance for incremental innovation or radical innovation to take place that will benefit the market and the social sphere.

Uber started as an innovative rebellion against the compliance norms set out to taxi companies. At least temporarily they found a way to circumvent the regulations and provide transportation services in a new way. But there have been other attempts after Uber finally threw in the towel and stopped operating in Denmark. Mover is a relatively new service providing transportation of goods. In their concept, private people could register and become transporters, given that they had a car fit for the job. As a twist of consumer circumventive innovation, the Danish MP Joachim Olsen used Mover to transport his handbag (Olsen, 2017). He did so as a ludic publicity stunt when Uber ceased operating in Denmark. Illustrating how Mover could still be used as an alternative to taxis.

Steward (2010) expands on Schumpeter's ideas, showing how levels of flexibility, information and stringency play an essential role in understanding the potential outcomes regulations might have. Furthermore, he brings out the importance of uncertainty that arises from any new regulations. He writes:

"Policy uncertainty has a mixed effect on innovation, although often it will precipitate the effects of the innovation dimensions of the regulation itself, regardless of whether the regulation is eventually enacted or not. For example, if firms expect a change in the stringency of a regulation to require compliance innovation, then policy uncertainty may spur innovation prior to the regulation being enacted."

Steward concludes with the importance of transparency and the abundance of information when it comes to regulations, to ensure the least amount of uncertainty.

However, transparency alone might not give the desired result. Pilkington and Dyerson (2006) argue that regulations effectively promote incremental social innovation, but the regulation has to be very precise and thought through to ensure that the new rules will induce the desired outcome, especially as companies tend to look for opportunities for circumventive innovation. They brought out an interesting example: There was a joint push from a governmental agency and electric car manufacturers to get consumers to buy more electric cars. The main influencer being reduced taxes on environmentally friendly cars. As an unanticipated twist, it was the manufacturing of combustion engines cars that had the most significant change, as they became more environmentally friendly. An unexpected result, but a good example of circumventive innovation.

Uncertainty is a rather big factor in markets with both major corporations and smaller players competing. Grabowski and Vernon (1977) found that compliance uncertainty due to a regulatory delay caused innovation in smaller firms to halt, but had no effect on larger firms as they were able to deal with regulatory costs more efficiently. The major differences further prove the previous statement about the importance of transparency and information sharing. In our case, although Uber and especially the drivers did not have the resources to adapt to the changes forced by the Danish government, Uber is big enough to be able to come back whenever the opportunity arises.

Another matter to consider for regulators would be to incentivise the change for companies. Taylor et al. (2005) found that this only works if the incentive system is transparent and is introduced as soon as possible, as otherwise it will be ignored or forgotten. In our example, most stakeholders already benefit from the model. Only Uber drivers could potentially be unwilling to adjust to the new system. For this, market research could be conducted to find out which percentage of the potential drivers are willing to adapt to a new system where taxes are paid automatically. This research would also help understand the mentality of the people and see how big of a share was only being Uber drivers to avoid paying taxes on their income.

# Innovation within taxation

The cryptocurrency movement that Nakamoto started is only a minuscule fraction of the use cases for blockchain. Although a relatively new area, some outstanding research has already been made. Ben Scull (2017) writes about the importance of blockchain technology adoption by accounting firms. He points out how auditing could become more trustworthy due to the fundamental ideas of blockchain. Once transactions enter into the blockchain, they can't be altered unless there is a consensus from the majority very shortly after. This type of security mechanism does not only make it easier for accountants and tax authorities but also more reliable.

There are already companies trying to implement an automatic taxation system. Vertex Inc. (Vertex, 2018) one of the leading providers of corporate tax software, is pushing to change the current model. They provide various services that help with automatic registering of taxes. As Buck (2017) writes, there are various governmental and institutional aspects to consider when implementing this system in such a broad perspective, but this could have tremendous benefits by basically abolishing the costs of auditing.

Outdated taxation systems are no new issue. Lau and Halkyard already in 2003 wrote a paper about the old rules for e-commerce and the need for OECD organisations to come up with updates to the growing area of e-commerce. Namely, their vision entails an international system where various service providers are all connected to tax authorities. As they point out, the most prominent challenges in this endeavour are identifying the taxpayers, getting access to verifiable information and ensuring an efficient mechanism for tax collecting. In the current paper, we would argue that a blockchain approach would get rid of those same challenges, due to the core ideas of blockchain.

There have been more case-specific attempts to change the current status quo in taxation. Hyvärinen et al. (2016) put together a blockchain based concept design to overcome problems governments have with major corporations. Hyvärinen et al. (2016, p. 441) write "Due to easily forgeable documents and insufficient international exchange of information between tax authorities, investors illegitimately apply for these tax returns causing an estimated damage of 1.8 billion USD, for example, in Denmark alone." Their prototype system would alleviate this problem and increase transparency regarding the flow of dividends. The project is focusing on the international aspects which makes the process incredibly slow as it requires intense collaboration between governments and state institutions.

# Innovation in finance - Open banking with PSD2 APIs

The original research proposal by Warnez (2017) did not specify how stakeholders in the conceptual model should communicate with one another. Although not necessary to fully define this in a high-level model, it does warrant a brief explanation of how this could be possible.



One of the recent legal innovations in the financial industry is the second EU Payment Service Directive (EU, 2015), commonly abbreviated as PSD2. The PSD2 went into force in January 2018, though not in its entirety. Regulatory Technical Standards (RTS) that entail Account Information Services (AIS) and Payment Initiation Services (PIS) will go effect only into in

Figure 5: Open Banking Model. Copied from Mirza (2017)

September 2019. The noteworthy part of PSD2 for this thesis is that external innovators will be able to use banks as a platform to provide financial services. More precise, the mandatory introduction of Application Programming Interfaces (API) will enable an entirely new set of competitors to interact with what otherwise was a closed banking environment (European Payments Council, 2017; Skinner, 2015). The non-IT reader should understand an API as a way of enabling communication between parties in a standardised way. A request is sent from one actor to another, and an answer is usually received within seconds. The use of APIs has been standard for over a decade in eCommerce and IT in general.

Banks are required to implement basic APIs in order to be compliant. However, they are not legally required to provide advanced APIs as we have in mind (Light, McFarlane, Barry, & Ruotsila, 2016). The big question is whether or not the banks of the platform companies will also facilitate and reasonably monetise an advanced API. Such an advanced API would be needed to allow for payments to be accompanied by an additional data flow to SKAT describing the economic activity that lies beneath the payment.

# How Uber works in other countries

There are a handful of countries where Uber is currently banned, a whole bunch where the matter is unsettled, but in other cases, compromises have been established between governments and Uber.

The main differences between countries lie within modification to employment statuses, tax percentages and the reporting rules. One of the reasons for the differences between countries is the broad spectrum of political parties that hold power. The strong political support for the incumbent taxi industry amongst the Danish political parties is the main factor for Uber's retreat

In Estonia, politicians actively welcome innovation, in their efforts to become the forefront of digital societies. Drivers have the regular option to create a company and register their revenue and expenses. Alternatively, drivers can also choose to make use of the 'Simplified Taxation of Business Income Act' and create a special business bank account for natural persons without a company. Their taxation percentage is 20% when earning less than 25.000 euro. They do not need to do their own reporting nor are they able to deduct expenses, considering estimated expenses are included in this low tax percentage.

Funds sent to this particular account are immediately taxed with 20% that goes to the tax authorities and takes away any other necessity to submit tax declaration. The 20% covers income tax, social tax and the mandatory pension fund contribution in Estonia (Maksu- ja Tolliamet, 2017). The new system has been made very accommodating to drivers, making the reporting a lot easier and potentially reducing fraud for the government. A specific bank account goes together with our idea of a third employment type to which the Estonian model with a modified bank account seems perfect, as it fits to already established models in society without any significant changes.

There have been other northern countries that were on very welcoming terms with Uber. In Finland, until last year, drivers could earn up to 10.000 euros, before they needed to pay VAT. They only required to pay the reduced VAT of 10% from their Uber earnings, as opposed to the typical Finnish VAT of 24% rate. To lower VAT is an interesting decision, as the government decided to regard Uber drivers as non-professional hobbyist drivers, yet the 10.000 euro VAT minimum is the same that applies to small-scale companies. Not only that, but drivers could deduct up to 0,25 euro per kilometre as deductible costs to their driving. (Zeldin, 2015) All the reporting seems to be built on trust, as we cannot find any mechanisms that the Finnish authorities are using to collect data automatically. Since last year the UberPOP service has been put on hold, as the ruling political party has started their lobbying against Uber.

In Uber's home country, the United States, Uber runs on a somewhat outdated taxation model. All earnings have to be reported by the drivers themselves in the form of a 1099-K form. The United States tax authority uses the 1099-K for voluntary reporting of third party network transactions (Turbotax, 2017). There is currently a public discussion to adopt Uber drivers as employees. Similar debates are happening in other countries, and few have led to a mutually agreeable solution.

In Belgium, UberPOP has been judged illegal in 2015, but services like UberBLACK are still running via a special legal construction originally intended for limousines (Pichal, 2018). Drivers register their own companies and are paid through them as subcontractors (Uber, 2018). However, there is a fiscal regime in Belgium for parts of the labour market that lead to 'miscellaneous income'. Some platform companies can apply for a special status and when approved, the company de facto collects 10% tax on the producing user's income, without VAT nor social contributions. No further expense deduction is possible in this scenario. The 10% tax and a yearly income statement are submitted by the platform company directly to the Belgian tax authority. A producing user does need to be mindful of not earning more than 5.100 euro through this tax regime. Otherwise, all the earnings are taxed as regular labour income, which just as Denmark can easily be forty percent. The food delivery service Uber Eats, under a separate legal entity, pays through this particular fiscal regime (FOD, 2018). There are ongoing negotiations to increase the limit to 6.000 euro, abolish taxes below this amount altogether, and to allow Airbnb to use this fiscal regime as well.

# Blockchain systems and relevant research

In its core, blockchain is similar to a very secure distributed database. The most prominent difference is the way how information is stored in sequential blocks of data, in which each block is linked to the entirety of all the preceding blocks. A blockchain implementation supported by a well functioning ecosystem is thus tamper-proof because all mining actors hold the same historical blockchain state. Transactions can only be appended, and the ledger of past transactions is immutable; hence provenance is secured as well. As with any complicated matter, there are various definitions in use to describe blockchain.

The original Bitcoin whitepaper by Nakamoto (2008) explains how a blockchain based system acts as a chain of digital signatures, where public-private key cryptography, hashing, timestamping and a decentralised infrastructure could be used to create a peer-to-peer electronic cash system. The peer-to-peer part of it is debatable anno 2018, as the system uses increasingly centralised miner nodes with special hardware equipment for processing transactions.

The most outstanding feature about blockchain and especially Nakamoto's Bitcoin is that nobody has ever come close to hacking the system as a whole. The high level of security is due to its tamper-proof qualities. Past transactions can never be deleted as they are known by the entire ecosystem, and new transactions can only be appended to the blocks. These qualities ensure that the transaction record is always intact.

# Decentralised vs Centralised & Unpermissioned vs Permissioned

There are many ways to build up a blockchain-based system. A blockchain can be anything from a public loosely organised ecosystem to a private highly controlled environment. We take a very pragmatic stance and will not dive into the ideological dimension that often overshadows such debates. Regardless, these design choices are important to discuss as they have strong implications for later governance. The common archetypes of a public blockchain and a private/consortium blockchain below in Table 4, with resulting subdimensions should always be kept in mind when designing a blockchain solution.

# Table 4: Blockchain archetypes

Public blockchain	Private/consortium blockchain
Unpermissioned	Permissioned
<ul> <li>Everybody can compete to</li> </ul>	$\circ$ Only authorised actors can
mine and process transactions	mine or process transactions
<ul> <li>Everybody can transact on the</li> </ul>	<ul> <li>Users need to be authenticated</li> </ul>
network without permission	and given permission before
Decentralised	transacting on the network
<ul> <li>Organisational: a lot of</li> </ul>	Centralised
individuals and organisations.	$\circ$ Organisational: a single or
<ul> <li>Geographical: scattered</li> </ul>	small consortium of trusted
around the globe	organisations.
	<ul> <li>Geographical: can be global,</li> </ul>
	but more likely to be more
	localised

# Functionality - smart contracts and decentralised applications

Functionality wise, blockchain has evolved in the past years. One can distinguish several generations based on functionality. In the first generation, only simple value transfer transactions are possible. This system works fine for most cryptocurrencies like Bitcoin and Litecoin.

The second generation is more complex with the introduction of Turing-complete programming language that allows for so-called smart contracts. Smart contracts are used to ensure automatic execution of a transaction, if specific coded conditions are met. An excellent example of this is Ethereum with the Solidity programming language. Here it becomes much more interesting to create functionality in blockchain as one can use regular variables and programming methods stored in an instance of a smart contract on the blockchain. A relevant example variable could be a taxation percentage.

The industry is currently trying to reach a third level entailing Decentralised Applications (DApps). This level includes advanced smart contracts, often interacting with each other and external data source providers. But as a system becomes more complex, more opportunities for coding problems, bugs and security holes arise. The Decentralised Autonomous Organisation (DAO) fiasco on the Ethereum blockchain in 2016 and resulting backlash is used often as an example to illustrate both the technical and legal problems around DAO's and 'law by code' mentality (Siegel, 2016).

When looking at the blockchain ecosystem, especially the start-up part of it, one cannot escape how many blockchain start-up companies are all trying to reinvent the wheel with a pinch of blockchain. Many want to be the next decentralised democratic blockchain version of established companies like Airbnb and Uber (Tapscott & Tapscott, 2016). The latter are themselves still competing, both with well-established traditional players and amongst themselves. A relatively well-known blockchain transportation competitor example anno 2018 is Arcade City. The argument of lower fees and no longer being dictated rules by a centralised Uber are sensible reasons for choosing blockchain (Marr, 2018; Tapscott & Tapscott, 2016). Whether that makes Arcade City legally compliant and a competitive venture is a whole other matter.

#### **Tokenisation**

Blockchain can be used as a de facto event log without transferring monetary value. However, most public blockchains still use tokens due to the ingenious system of transaction fees, which are an incentive for miners to also process transactions. Miners, especially when not creating new coins when a data block is added to the blockchain, are also referred to as transaction processing nodes.

For this endeavour, a tokenisation process would be beneficial. The concept is inspired by the KYC Optimization paper by Parra-moyano & Ross (2017) and, the so far working case of
Tether (Ticker: USDT) which is a cryptocurrency that is (imperfectly) 1:1 exchangeable to the US dollar (Tether Limited, 2016). In this specific project case, a Danish-only crypto Crown (from now on called cDKK) would be created. cDKK should be pegged to the real Danish crown, to ensure no volatility towards the actual pegged fiat currency. This layout would provide a conventional unit of accounting and would make sense to all actors involved.

This move could be implemented by the central bank, who could ensure that this cDKK is exchangeable for the real DKK. The central bank should be involved as they are the central part of monetary policy in Denmark. Furthermore, this could act as a pilot project for a nationwide issuance of cDKK in the future. Regardless, the cDKK could be implemented by any party, as long as they could guarantee 100% the possibility to exchange cDKK's in circulation to regular DKK. In this light, we scouted and found a fintech company named Aryze that tries to offer a stable-coin version of the Danish crown with a perfect 1:1 peg. Aryze's website (2017) is currently scarce on information, but we suspect that they would offer an I Owe You (IOU) token that has full reserve backing with traditional DKK at one or more banks.

On an even more futuristic note, it is feasible that in a decade self-driving cars can contribute to the transportation market. A self-driving car equipped with a digital currency wallet would pay for its charging costs and accept funds for transportation services. Thus, with a blockchain system that processes all the payments, both revenue and expenses could automatically be accounted for in the owner's income statement.

## Usage fee

When it comes to charging usage fees, it depends on the owner of the blockchain platform, the governor of the system and the regulating authority. This kind of complexity means that there is no straight answer to the issue and the diversity of players opens up to even more problems, like the payback time required for the investment, number of transactions to split the fixed overhead costs, etc. As the government will potentially enforce the concept, then maybe it should be the state who is in charge of the decision making. Not only that, but also to provide funding and manage the platform. It is important to remember that when people pay with Visa/Dankort, the usual legacy channel fees apply. Meaning, it would merely add an extra cost to the transaction total.

Whoever takes charge of the system, will have a multitude of options to choose fee setting. It is a matter of making a strategic choice for a fixed fee, variable fee, mixed model, minimum fee, maximum fee, subscription model, etc. For example, there could be an absolute fixed fee of 1 DKK per transaction, which could then be lowered if the market size has grown and has stabilised.

#### **Privacy**

Input Digest cryptographic DFCD 3454 BBEA 788A 751A Fox hash 696C 24D9 7009 CA99 2D17 function The red fox cryptographic 0086 46BB FB7D CBE2 823C iumps over hash ACC7 6CD1 90B1 EE6E 3ABC the blue dog function The red fox cryptographic 8FD8 7558 7851 4F32 D1C6 jumps ouer hash 76B1 79A9 0DA4 AEFE 4819 the blue dog function The red fox cryptographic FCD3 7FDB 5AF2 C6FF 915F jumps oevr hash D401 C0A9 7D9A 46AF FB45 the blue dog function The red fox cryptographic 8ACA D682 D588 4C75 4BF4 jumps oer hash 1799 7D88 BCF8 92B9 6A6C the blue dog function

The EU General Data Protection Regulation (GDPR) goes into effect on 25 May 2018. This new

Figure 6: Hash function explanation. Copied from Wikimedia commons (2018)

privacy regulation requires an in-depth investigation by legal experts in every industry. Unfortunately, the GDPR was written with a strong focus on centralised data storage systems; not immutable blockchain systems. For example, the GDPR's 'right to be forgotten' is almost entirely incompatible with storing personal data in a blockchain system. Even the categorisation of a blockchain public key address or hash (digest) of personal

data leads to debates about whether or not these can be considered personal data.

Readers unfamiliar with a hash function can refer to Figure 6 illustrating how an input results in a hash digest going through a hash function, in other words f (input) = hash digest. A secret salt, a secret random value, is also needed for the hash function to increase resistance against hacks and reverse lookups of the hash digest and simple short original input data. The random value is also a best practice when storing users their often too simple hashed passwords in a database.

Depending on the angle one takes, although the data itself might not be personal, information connected to the data can be regarded as private and thus what may seem like not personal data, may after all be subject to GDPR. A meticulous analysis of the current rules needs to be conducted before SKAT takes any decisions. A preliminary investigation of the GDPR, in particular articles 17 and 23 (EU, 2016), would suggest that the Danish state could give SKAT and another actor an exemption of the standard GDPR rules considering the official purpose of taxation. This is a luxury most private sector blockchain companies will not have in the European Union.

On the matter of private sector players, privacy is also important here; one would expect that competitors will want to hide transactions from their rivals, e.g. Uber vs Lyft. Fortunately, as the system would be built on a permissioned blockchain, the system can be designed in a way where participants only see transactions relevant to them (IBM, 2017a).

## Dispute resolution – Editing the chain

One of blockchain's core advantages is immutability, the inability to alter the historical state. Once a transaction goes through, it is settled and final after a certain number of confirmations. In Bitcoin, a transaction is considered cleared by most people after 3-6 confirmations, which usually takes place within 30-60 minutes after submission to the temporary Bitcoin memory pool. Afterwards, it becomes computationally infeasible for a block to become orphaned. Ignoring double spending attacks, the rare set of orphaned transaction will be detected and the transaction will return to the temporary memory pool for resubmission in a new block if not already included in the other blocks that pushed out the orphaned block. Regardless of how Bitcoin exactly works, this entire process of submitting and confirming a transaction could be reduced to a matter of seconds in a permissioned system.

Editing an existing transaction cannot be done in a public network like Bitcoin, but is slightly more likely when a major error occurs and a strong organisation backs a correction or partial rewinding of the most recent transactions in a blockchain. The most known example of this is the Ethereum blockchain DAO hack and resulting hard fork that led to a chain split in Ethereum (ETH) and Ethereum Classic (ETC). The interested reader can learn more from Siegel (2016) on this particular topic.

The more recent debate in 2017-2018 on how to handle the locked-up Parity contract wallet illustrates that the public Ethereum network is ill-suited to deal with fixing errors for even the most high-profile cases. A smart contract code bug locked up 513774,16 ETH, worth about 300 million USD in April 2018, has been inaccessible for six months without any resolution in sight as the latest proposal Ethereum Improvement Proposal 999 did not pass a community vote (Buntinx, 2017; Johnsen, 2018; Trustnodes, 2018).

Exceptional Ethereum correcting forks aside, the only good way to edit a transaction is to use append-only correcting transactions and thus retain the immutability of the historical record. For example, if party A transfers money to party B for illegal purchases. A governing authority, or set of governing actors, could blacklist the specific funds sent to party B, making it unspendable and worthless for the criminal. Alternatively, the funds could be confiscated as well. Although this may sound like an impossible task to achieve in a public unpermissioned network, it may very well become the case in a few years for some of the leading cryptocurrencies. Perhaps not at the protocol layer, but elsewhere in the ecosystem at entry and exit points. For example, at exchanges that are subject to compliance regulations.

In a permissioned system, one could use a similar approach, e.g. the Hyperledger open source system, which uses a Certificate Authority that is responsible for user enrolment and certificate handling (IBM, 2017b). In their system, the party in charge can issue and revoke certificates. Not only that, but they can append correcting transactions when needed. These control mechanisms make a permissioned and more centralised blockchain solution the only appropriate design choice from a governance point of view in many businesses or state contexts.

## Literature summary

The conducted literature review provided us with insights into the chosen research subject that we used when designing the conceptual model and interviews. When studying platform businesses, we understood the crucial need for an easy reporting system to SKAT. When looking at innovation on a governmental level, we learned that it is flexible, incentive-based regulations that are most welcoming as it will allow implementations throughout the whole market. Our analysis around innovation in banking at the same time revealed the possibilities of PSD2 APIs. We also studied our case subject Uber in other countries than Denmark and found that states treat Uber in various ways. Lastly, we studied blockchain related issues and found that the upcoming GDPR is somewhat incompatible with our solution.

# Stakeholder map

To provide an overview to the reader and to ensure that we have taken into consideration all actors involved in this new taxation system for platform businesses, we will draw up a map of the most important stakeholders.

There are many interests for parties to be involved in this system. Some might gain financially, some see this as a political battle and others see benefits to status. If we take reputation as an example, organisations that would be involved could afterwards be portrayed as more innovative entities. The Danish tax authority SKAT could be one of these organisations. SKAT's reputation among the general public has been on the decline due to the IT system and taxation scandals. The crisis happened due to the EFI taxation failure that by itself costed 475 million Danish crowns, which led to delays in collecting billions worth of outstanding debt (Jørgensen, 2016). The government's response - however illogical one might consider it – was to split SKAT into seven different parts.

All parties involved should be incentivised to participate in the proposed solution, although this could become difficult for the producing users, which in Uber's case would be the drivers. Some drivers might have the mindset of using Uber to avoid paying taxes and rebel against the system. In a broader platform business sense, there can surely be parties that might refuse to cooperate, and some will even sabotage the design process. For this, it might be wise only to involve the utmost necessary parties in the development phase and coerce the rest into complying with the model later.

To begin with, we will adapt Mendelow (1981) stakeholder concept, where parties fit into quadrants based on their level of interest in the proposed system and their level of power to influence it. The categorisation in Figure 7 below is based on our assumptions before starting the interviews. By interest, we generalise into an overall level of attention that a specific party will potentially give this concept. Using this approach means that somebody with a strong negative sentiment and somebody with a strong positive attitude will be shown on the same level. Based on the level of interest and power, the drawing can then be subdivided into four quadrants.



Figure 7: Stakeholder map

## Manage closely

Stakeholders that have a lot of power and similarly a lot of interest in the project should be kept in close vicinity. These are players who should be getting new information first and their opinion should be taken into consideration every step of the way, as their opinion has the potential to hinder or boost the development of the concept. In this quadrant we have three key players.

## Tax authority

SKAT is the tax authority in Denmark. Depending on the implementation of the proposed model, it could be immensely useful for tax authorities. As explained earlier, 30% to 99% of the Uber drivers did not pay their taxes correctly in Denmark. As SKAT would most likely be involved in governing, implementing and probably covering some of the costs of development

they do have some power when it comes to decision making. There are also other reasons why they should be very interested in the implementation of this concept.

The concept could provide a better revenue registration model providing the Danish state with more tax money, as SKAT manages the tax collection. Furthermore, SKAT has suffered a reputation decline to some unfortunate scandals as mentioned earlier. Using innovative technological solutions would show a newfound capability in facing challenging ideas before most other countries.

### Political parties

As in most countries, Danish political parties are split in a left-wing and right-wing economic spectrum. The breadth of the division also opens up a whole array of considerations.

Depending on the party, a new adaptation to the tax system could be welcomed or instead feared. For some, this would be an exciting adaption of new technologies that help collect taxes, but to others, it would take away voters as they advocate for old Danish ways where innovation is only welcomed when necessary.

Second prominent aspect is building control. In our own experience, the current level of blockchain education is rather low, and some parties might think that adopting something they do not understand would reduce the level of control they have. Paradoxically, some players might see it as an increase in control, due to their very different understanding of blockchain technology.

There are also other considerations, like branding Denmark as a fintech hub, building general expertise in blockchain usability, attracting well-paid professionals to Denmark and the fear or job loss due to an automated system. These aspects are relevant and important, but will not be discussed in-depth.

## Taxi associations

To generalise, this could also be called brick and mortar associations. For every platform business that arises, some industry is getting disrupted. Changes in the market mean that there are businesses that find new innovative platforms very harmful for their livelihood. In the case of Uber and the transport industry, this is the case for taxis. In Denmark, Dansk Taxi Råd represents the interests of taxi companies and taxi license holders. They do not have direct political power, but they can influence media and express their opinion. To contain harmful outbreaks, they should be managed closely.

## Keep satisfied

The second quadrant is called keep satisfied. In this quadrant, some players have influence in the market but do not have a significant interest. Their opinion could be both beneficial and harmful, but as long as they are satisfied, they do not have any interest to use that power.

## Central bank

The Danish Central Bank (Danmarks Nationalbank) is a relevant actor to discuss because of its unique position of being able to increase the money supply. Our solution could be an invaluable controlled back-end pilot project, a project that would also help build blockchain expertise within the Danish Central Bank. On an even more futuristic note, it could be the start of a nation-wide used crypto Danish crown. Being engaged in such activities would undoubtedly be an image booster and increase the relevance of the Danish Central Bank.

However, one should not be optimistic when it comes to innovation and a public institution like a central bank, particularly on this topic with challenges on managing the money supply, inflation, financial system stability and central bank role and reputation (Sauer, 2016). A great deal of conservatism should also be expected due to outside pressure from traditional finance. After all, the 'be your own bank' mentality behind the most prominent (disinflationary) blockchain cryptocurrencies does not rhyme well with the current fractional reserve banking system and money creation. Our overall impression is that the Danish Central Bank would not cooperate in the nearby future, but might not stand in the way of a full reserve backed IOU token issued by a private company.

## Keep informed

There are also players that might have a high interest in the concept, but simply lack the power to make a big impact. To keep unnecessary mishaps to a minimum, these players should be included in the major developmental aspects, but are not necessarily included in every decision-making step.

#### Unions

The Danish society is strongly unionised. In 2014, 69% of all members of the working class were members of a labour union (Flensburg, 2014). An interesting aspect around unions is their specialisation. Every union is specialised in some specific group or demographic. To illustrate, the union HK handles office workers, while CA deals with highly educated business professionals. Currently, there is no union solely focused on the so-called gig economy. But it is clear to see, that the union interest and actions are increasing in the area (LO, 2016; Hansen, 2018).

For now, unions are not too powerful in the Danish market, as companies like Uber do not hold drivers as employees, but rather as freelancers. Due to the vast popularity of unions, they are still categorised as high interest. In this aspect transparency is key, to ensure that nobody could grab on to something potentially harmful for platforms, just because there is confusion around the area.

#### Taxi companies

When Uber launched, it were taxi companies and their representative drivers who made the most fuss. Not surprisingly, considering personal transportation has been primarily a taxi drivers business. Due to the price pressure from Uber, the taxi companies are still very high on the interest level and should be kept in the loop. If not, a strike or a media attack might be launched towards Uber drivers, where only negative media coverage would be surrounding Uber.

When Uber operated in Denmark, it was able to transport people with a considerable discount against the standard taxi service. Price drops make consumers wonder about the old pricing model and can slowly move the masses towards platform businesses, which will subsequently force taxis to lower their asking price. So it might be in the taxi driver's interest that the conceptual model discussed further on does not go into effect.

#### **Platform businesses**

In the current moment, platform businesses do not have a lot of power in Denmark. Although they represent an innovative new future, they are usually considered outsiders that are going against the status quo and thus lost their influence. The low level of power could actually raise their interest level. If a blockchain based system, that is meant for platform businesses, gets a green light from both governmental stakeholders and the tax authorities, that would send a clear signal that technological innovation is welcomed in Denmark, as both blockchain and platform businesses are areas that are somewhat new and not well regulated so far.

Uber is expected to have a very high level of interest in our concept. What we suggest will be an enabling factor for them to return to the Danish market. Though the Danish taxi legislation still needs to be modernised for them to be able to return.

### Monitor

Lastly, there are the stakeholders in the minimum effort quadrant. These are still relevant to be mentioned, but have little power and interest in the matter of implementing the model.

### **Producing users**

The first group that comes to mind are the past Uber drivers. They hold very little power, as there will always be people who need an extra income and although they are interested in Uber's return, they hold little interest in the implementation part that happens in the backend. What does increase their involvement is the automatic revenue registration and tax evasion matters. Using our concept makes tax evasion quasi-impossible, which might scare some drivers off. At the same time, an automatic system would mean less worrying about selfreporting and would add legitimacy that would bring new drivers to the market.

#### **Consuming users**

Consumers are interested in the return of the service and based on the conditions they steer the general market. But they will not be involved at any stage nor will anything change from their perspective. Once the service is legally usable again, consumers can use the app just as they did before. If anything, more consumers might be drawn to Uber when it operates within a legal framework. The only noteworthy power consumers do have is electoral pressure.

## Blockchain platform providers

Another stakeholder in this quadrant is the blockchain provider. At this point, there are only a few key players offering services that could help implement a blockchain based system along the lines of our proposal, first to mind are IBM and Microsoft. Currently, there are not a lot of examples of working enterprise-grade blockchain-based systems, especially in the public

sector. It can very well be that the companies providing such a service will compete in being the ones involved, as it could be an excellent example of their expertise and a source of revenue. When it comes to power, these companies cannot do a lot, as the tender they would be provided would most likely govern everything that the system must be able to do. Still, being the experts in the field, they would have the power to advise and steer the system in their vision.

#### Payment service providers

Payment service providers in Denmark, such as NETS and Danske Bank with MobilePay are interesting stakeholders. The original ideology of blockchain is to get rid of slow and expensive middlemen such as banks, so letting this system be integrated with the Danish tax authorities, could seem threatening to the payment providers. Having that said, it could instead spark an opportunity for traditional financial actors to shape private-permissioned blockchain type ecosystem and help them stay relevant in the future.

# Designing the conceptual model

Past sections of the literature review and stakeholder map have served as components to the DSR knowledge base. A lead-up to this section, where we dive into the actual design choices taken alongside the conceptual model. In essence, we propose a system that is vastly different from known decentralised and unpermissioned cryptocurrencies and tokens like Bitcoin and Ethereum. In our suggested conceptual model, the Danish state orchestrates the other stakeholders for the specific purpose of taxation, and the blockchain should thus be administered and controlled by the state tax authority SKAT.

## Permissioned & Centralised

We propose a permissioned system that is strongly centralised with a limited number of stakeholders having access to the system to process transactions and access the blockchain directly. Identity verification is required to submit transactions on the blockchain, both personal for producing users and for organisations. Identity verification of producing users could be done by requiring that their accounts on the blockchain be linked to the commonly used NemID system in Denmark.

In addition to this, all entities need to be encompassed within an advanced user management system that can attribute different levels of access controls. E.g. an Uber driver should be able to see his or her account, but not the account of a fellow driver. Uber as a company should be able to view the accounts of all their drivers, but not of the same people working at another company like Lyft. In general, rules need to be determined for who has permission to add or even read information and for which purpose. This described permissioned system might work with a certificate authority, having that as an intermediary in the blockchain system would also help to solve the problem of users forgetting their passwords and otherwise being permanently locked out of their account.

## Tokenised Danish crown

The blockchain should be tokenised so it can be used for value transfer, but not be accessible to the general public. In other words, and as mentioned in the literature review, the cDKK IOU tokens with a 1:1 relationship to the Danish crown should only be used in a back-end system. No new money is created in our suggestion, cDKK IOU tokens are 100% backed by the Danish

crowns issued in the past by the central bank. Reason for suggesting this particular setup is to keep the project under full state control and prevent unintentional usage that could threaten traditional financial institutions and conservative actors with a lot of political power.

## Absolute per transaction usage fee

Tokenisation also allows the charging of a usage fee directly for each transaction. As explained in the literature review, there are many considerations and different options to charge a usage fee. We do not have a clear suggestion on this matter and will query the interviewees on their opinion. As a preliminary suggestion, we choose to set an absolute transaction fee of 1 cDKK for each transaction submitted to the blockchain. The fee should be paid by the company initiating the transaction and should not be interpreted as being deducted from a payout. In the case of Uber this would result into an additional 1 DKK transaction fee per weekly payout of the driver. This fee would by no means pay for the State to create nor even maintain the system. However, the system could eventually become a budget neutral operation for the Danish state as over time more companies would use it.

# Off-chain data storage of original data + on-chain hash

Besides value transfer, a hash of the original data should also be stored on the blockchain, while the original data itself ought to be stored in an accompanying database to facilitate easier and faster access, limit GDPR issues and avoid overloading the blockchain. In essence, we suggest using the disruptive potential of blockchain to directly link a financial transaction in the blockchain with the description of the underlying economic activity in a database.

Using the weekly Uber driver payment as an example, a description of the provided services is sent along in an advanced PSD2 API payment request to the bank. This could include list of all the trips, prices, kilometres driven, dates and times, trip geolocation information, etc. This information could then be stored off-chain while the hash of the data stream could be stored on-chain by submitting it to the driver-specific blockchain smart contract. Upon successful processing by the smart contract, the bank submits the original data to the database under control of SKAT.

SKAT could then use the information in the database to correctly attribute and tax specific earnings of the producing user. Other state institutions and the government could also use

this data, potentially in a censored form for analysis to gain additional knowledge, statistics and insights in the platform economy; Erhvervsministeriet (2017, p. 58) also mentioned this as part of their overall plan with initiatives 19-22. If any data needs to be altered or removed, it can be done so in the database. Re-computing a hash based on the altered data would lead to a different hash than the one stored within the blockchain, and thus one would know that the data has been changed.

## Initial functionality: revenue registration & automatic taxation

An often heard ironic and appropriate question in the blockchain sphere is 'Do you need a blockchain?'. The use case for choosing blockchain as a technology severely diminishes when opting for a permissioned and centralised system. Nevertheless, choice for blockchain can be defended from multiple angles. Using blockchain entails using a complex system of encryption that protects sensitive information, prevents tampering, and provides a whole new array of additional functionality. The blockchain, likely with an additional database directly linked to it, can function as a single point of truth for different stakeholders.

Table 5 shows the different functionalities we considered. We propose first to implement the basic and initial advanced functionality, and only afterwards continue the development with some of the items under potential long-term future functionality or integrate with partner add-ons. This incremental development approach fits within the AGILE development mindset of software development, along these lines we also suggest building the functionality first in a sandbox environment as a proof-of-concept to help convince sceptical stakeholders.

Basic	Initial advanced	Potential long-term	Partner add-
functionality	functionality	future functionality	ons
• Revenue registration	<ul> <li>Financial payment flow</li> <li>Automatic producing user taxation</li> </ul>	<ul> <li>Expenses registration</li> <li>Automatic VAT (MOMS) tax collection</li> <li>Automatic corporate taxation</li> <li>EU-wide implementation</li> </ul>	<ul> <li>GPS hardware</li> <li>Big data analytics</li> </ul>

## Table 5: Blockchain technology enabling advanced functionality

### Basic functionality: revenue registration

Blockchain is overkill for the mere purpose of basic revenue registration. Mere reporting of revenue streams could be done with well-tested technologies such as APIs. Especially considering that what could be recorded on the blockchain is based on what happens outside the blockchain. This makes it pointless to use blockchain as it would only hold a representation of facts happening solely in other systems.

#### Initial advanced functionality: payment & taxation

Using blockchain does become more appropriate when adding an actual financial payment flow and automatic taxation. Blockchain is particularly suited for monitoring financial flows and clearing is an integrated functionality of blockchain, making the blockchain the single point of truth. Furthermore, blockchain technology can interact with other IT technologies creating a larger interlinked ecosystem of financial transactions, accounting and record keeping (Andersen, 2016).

Every token or fragment of it can only be at a single place at any given point in time; money in a blockchain wallet is more similar to cash than to a regular bank account. Along the same lines, the reader needs to understand that a bank account balance does not exist in a blockchain setting. This might sound surprising to many only familiar to the graphical user interface of a cryptocurrency wallet. A user's cryptocurrency balance is constructed by a clustering of addresses that belong to a user's wallet for which one has the decryption keys or certificates as would more likely be the case in a permissioned setup. This brings us to an interesting choice, should the user have sole control over their money, or should a bank have control? Explained differently:

- Idea 1: Uber has access to their bank account through an API that allows them to send money to the bank of the Uber driver. Data such as the identity of the driver is sent in the request and also recorded in the system. Thus, money is transferred from bank to bank, thereafter the bank knows which driver it owes money to.
- Idea 2: Uber has access to their bank account through an API that allows them to send money directly to a specific account for the driver held at the bank of the driver.

Thus money is transferred from Uber's bank to a specific account of the driver at the bank, without the bank having access to the funds.

Both ideas could work, but we would expect that a bank prefers idea 1. The argument for a bank being against idea 2 is that people are currently not the direct owners of their own money at a commercial bank. There is a claim towards the commercial bank for the funds. This is no longer the case in idea 2 if the bank could not access the money without direct user consent. Thus, idea 2 entails that banks would no longer have the user's money as an actual deposit nor liability on their balance sheet.

In other words, idea 2 challenges the entire workings and function of a bank. Regardless, taxation would happen during this process by initially sending the money to a smart contract created separately for each company-driver combination. The smart contract takes a percentage of the money and sends it to an account at the tax authorities. The percentage could be stored within the smart contract and managed by the tax authorities to better reflect the expected due taxes on a yearly basis for the particular driver.

## Potential long-term functionalities

After a blockchain system with the already described functionality would be implemented, a future addition to the system could be cost registration. The reason why we exclude this in the original design is multifold. First, to limit further complication in an already complicated setup with many stakeholders. Second, the burden of proof is on the driver side for the expenses. Thirdly, the cost registration would not be linkable to the actual payment flow that would still happen on legacy systems. Thus, the source of truth for the expense deduction would lie outside the blockchain system.

For example, an expense deduction per kilometre driven would not result in a financial flow in our proposed blockchain solution. One could of course keep a set of variables in the companydriver specific smart contract for the purpose of keeping track of expenses, but that would just be for accounting purposes and might not be appropriate to organise in such a manner. We realise that a blockchain solution would be overkill if only used for Uber, and that if it were to be implemented should eventually be implemented for both labour focused platforms and even capital platforms. In this regard, the reader might wonder why we omitted VAT. The first reason for omitting VAT is that VAT is a consumption tax and thus notably different to handle than income taxation. Second, VAT does not have to be paid by every producing user, that depends on the type of economic activity and the amount earned. Third, transportation services provided by a taxi company or platform company like Uber are VAT exempt in Denmark. Fourth, a platform might offer different services that could lead to both capital income and labour income. Fifth, when a platform offers multiple services, some could be exempted from VAT while others are not.

All-in-all, we think that SKAT should attribute the paid taxes into their respective categories based on the off-chain detailed information. If SKAT would (initially) be incapable of doing attribution and thus still rely on self-reporting, then the off-chain data can still be used for manual controls. In this case, the financial flow itself would only serve as a mere pre-collection of taxes.

We thought about other uses such as flat-rate corporate revenue taxation and EU-wide implementation of the system. However, these ideas we initially mentioned as mere political trials for the reader to contemplate about for a distant future. We consider it politically unrealistic with all the different EU member states with their national legislation, interests, corporate lobbying etc. The option to pay cash directly to the producing user as opposed to digitally via the platform company further complicates EU-wide adoption.

However, the European Commission recently surprised us by issuing a statement (EC, 2018) that it intends to tax large digital companies with two distinct legislative proposals better. The first proposal would be a long-term reform of corporate tax rules for large digital platforms with profits taxed across different members states. Member states where the company has a sizable activity would be able to tax a proportion of the profit the companies make; the taxable proportion would be determined based on the activity by a business with its users in different states.

Secondly, and only as a short-term measure, the Commission suggests an interim tax of 3% on the revenue instead of the profits. However, whether or not any of these two measures will get approval by Council of Ministers or the European Parliament remains to be seen. Even if approved, effective implementation is still another story.

#### Partner add-ons

One of the critiques against companies like Uber is that there are no control devices, like seat sensors. We might not agree with this, but we do think it is worth mentioning that GPS hardware devices could be made obligatory to install in every car used for personal transportation services. This hardware device could provide data about the car's movements. This information in combination with data provided by taxi companies and platforms could then be used to develop a system for illegal ride detection. Certain hot zones in terms of geography and timing could be identified, and that information could be used for sending out inspection agents. Having said that, we think the expenses would vastly outweigh any possible additional revenue in taxes and fines for the state. We reiterate our statement that fraud detection is best done by the ones that stand to lose the most from fraudulent drivers, namely the companies themselves.

One does need to keep an open mind and consider all options. There might be a future need for such an expensive and drastic control measure. Imagine the scenario in which an Uber or Lyft driver would also simultaneously use another smartphone app to organise the same services but off the radar of taxation authorities. Arcade City (2018) is a project currently in development aiming to provide a more democratic form of peer-to-peer ridesharing around the globe, very similar to Uber, but with lower commissions and payments through their own cryptocurrency Arcade Token.

Technically speaking, taxes could be avoided by only directly accepting Arcade Tokens or any other cryptocurrency. However, a detectable swap to a more known cryptocurrency like Bitcoin or fiat currency is most likely necessary, and that can increasingly be monitored by states requiring exchanges to implement Know Your Customer (KYC) and soon Know Your Transaction (KYT) policies. The latter is made possible by blockchain monitoring companies such as Chainalysis (2018). But as with any blockchain start-up, we are extremely sceptical of the survival chances Arcade City has. Especially considering this is not the first transportation start-up that tries to challenge the dominance of existing players in a market categorised by relatively low margins and high competition. Coming up with a good business idea is one thing, executing it and gaining market share is another.

## Governance by Danish tax authority SKAT

Not only does the concept need to be built, but also regulated, administered and potentially updated from time to time. As the government will benefit the most from the idea, it could be argued for them being assigned to govern and regulate this. For this, one of the newly appointed departments of SKAT, namely the one for development and simplification (Udviklings- og Forenklingsstyrelsen) could perform this function. SKAT's initiative does not exclude other players, like banks and NETS, from contributing to transaction processing and validating though.

However, creating the system could be too tedious for SKAT and might stretch their resources too much. A potential solution could be to write an open tender and outsource the implementation to leading experts. Using outside experts, together with a known, open, API-enabled and standardised blockchain fabric layer could be a very plausible approach for a successful launch.

For this, IBM Hyperledger or Microsoft Azure Blockchain solution (IBM, 2017c; Microsoft, 2017) could work well. IBM would be an attractive candidate as a premium member of the Linux Foundation helping to develop the Hyperledger Fabric technology. The Hyperledger project encompasses many blockchain related tools, when further referring to Hyperledger we refer to the Hyperledger Fabric blockchain core technology itself. (IBM, 2017c, 2017d; Microsoft, 2017; The Linux Foundation, 2017; The Linux Foundation, 2017; The Linux Foundation, 2018). IBM also has industry experience and has developed several small proof of concept applications. IBM recently announced a joint venture with Mærsk to digitalise the global trade supply chain (Mærsk, 2018).

## Conceptual model

As mentioned in the methodology section while discussing design science research, one of the steps in design science research is evaluating a tentative design based on stakeholder feedback. We mapped a tentative design in the form of an initial conceptual model shown in Figure 8 and presented the walkthrough that follows as an explanation to the stakeholders. Their walkthrough was slightly differently formulated as the references were removed to decrease the text length.



Figure 8: Conceptual model

### Walkthrough of conceptual model with Uber as example

The example here illustrates how the flow of interactions between stakeholders could look like. Note that only a single transaction is used here for simplicity reasons, in reality some of the amounts would be a lot higher due to aggregation.

#### Step 1: Passenger pays

The passenger pays using a legacy payment method such as Dankort/VISA. In the shown example the payment consists of 101,5 DKK. Nets (2017) does not list the precise amount it charges on their website and uses individual agreements to determine the exact rate. A transaction fee of 1.5% seems to be a reasonable assumption based on the available information. The remaining 100 DKK is transferred to the bank account of Uber.

#### Step 2: Uber pays driver

Based on Uber's (2017b) website, payments from Uber to the driver are aggregated on a weekly basis and paid out on Thursday. In this example, we assume that Uber on average keeps 25% of the ride fee (Karol, 2016) and thus transfers 75 DKK back for this particular ride to the driver. The payment to the Uber driver is done through a new API for platform businesses, that allows for sending additional information.

#### Step 3: DKK $\Leftrightarrow$ cDKK swap

The sending bank recognises that the outgoing payment is intended for an Uber driver. Therefore, the bank swaps the 75 DKK for 75 cDKK with the central bank. In reality, this would be an aggregated amount, potentially swapped on a daily basis if a lot of platform business use this system.

#### Step 4: Payment through smart contract

The sending bank transfers the 75 cDKK through the smart contract associated with the driver. The smart contract will split this amount in three parts. In our proposed setup the blockchain provider will get 1 cDKK per transaction. The remaining 74 cDKK is regarded as taxable income for the driver and subsequently taxed. The used tax percentage could be adjustable as is the case for employees changing their preliminary tax statement (forskudsopgørelsen). In the example, 40% = 29 cDKK is sent to the bank of SKAT and 45 cDKK is sent to the bank used by the driver. At this point, the receiving banks also updates the bank account statement of all three parties.

Along with the tokenised money transfer, a hash of the data stream is also submitted to the blockchain smart contract. Upon successful processing of the smart contract, the sending bank submits the original data, upon which the hash signature was calculated, to a traditional database required by the state. Example of such off-chain information with Uber drivers could be trip price, geolocations and duration.

## Step 5: cDKK $\Leftrightarrow$ DKK return swap

The banks of the blockchain provider, SKAT and the drivers can at their own discretion decide when to exchange the cDKK token into 'real' DKK with the central bank.

For the sake of completeness, we inform the reader that the database was originally included in the explanation but not in the conceptual model drawing. The database was added from the 5th interview onwards to make it clearer for the interviewees. Furthermore, the conceptual model did not exist at all during the first interview with Dansk Taxi Råd back in 2017. Neither did we use it with the last interview with Meploy considering it was a shorter phone interview focused on Meploy and their transition from using subcontractors to employees.

## Conceptual model summary

In the conceptual model section, we have established various aspects that play a major role in the design process. To start, we argued that there need to be clear rules about permissions in terms of who is allowed to add or even read information and for which purpose. As a preliminary suggestion, we choose to set an absolute transaction fee of 1 cDKK for each transaction submitted to the blockchain, this could change later on, depending on the focus of the project. We also discuss long-term functionalities, like cost registration, which could be valuable add-ons once the system is running.

An often-asked question is if blockchain is necessary, to which we have argued for. Using blockchain entails using a complex system of encryption that protects sensitive information, prevents tampering, and provides a whole new array of additional functionality. We also discussed potential GDPR issues, such as the potential conflict with the right to be forgotten and storing a hash based on personal data. We ended the section with a walkthrough of the main steps of our conceptual model and how they should be understood by the reader.

# Data analysis and findings

This section starts with the most important feedback from each interview and finishes with a combined overview table summarising the feedback. Based on this feedback, we afterwards present a revised stakeholder map and revised conceptual models.

## Feedback from interviews

Nine interviews were conducted that represent a large part of the stakeholders. The interviews were fully transcribed by the authors and particularly valuable feedback was extracted and summarised in the section below. The interviews were conducted in a semi-structured manner to assess the feasibility on a technical, political-legal and business level.

### Dansk Taxi Råd

The Danish Taxi Association is the national association for the taxi industry, and as they write on their website, they represent around 75% of the taxis in Denmark (DTR, 2018).

The public relations representative from Dansk Taxi Råd was aware of the cryptocurrency implementations of blockchain, but he did not have any strong opinion on the exact details of our solution. From a technical side, the interviewee talked about the innovation that Uber has brought with them to Denmark. The taxi industry in Denmark had been on a rather stagnated state, and it seems that Uber has given all of this at least a little push. There are now well-functioning taxi applications that make hailing a taxi a lot easier, something that did not really exist before Uber.

The representative also mentions how impressed he was with Uber's driver rating system. He did though express how hard it would be to implement a rating system on taxi drivers due to restrictive Danish legislation, but he hopes that something similar will be implemented, as it helps to push the level of service that the drivers provide.

Another hope we discussed, was the opening of current legislation. Within three years there should be some major changes to the rules around being a taxi driver, especially around the number of drivers that are allowed to operate. One thing that the politicians are still holding on to are the seat sensors, as they seem to be the holy grail of safety mechanisms. This was also one of the main talking points around Uber, as usual, feedback from the opposition was

that one could always turn off the app and operate as a rogue driver. A statement strongly countered by the Uber representative further on.

In Denmark, the taxi industry has always been very strictly governed, there is even a maximum number of licenses an area can have. Rigid rules ensure that the market does not get flooded and the drivers would always have work. The introduction of a whole fleet of unlicensed Uber drivers was a challenge for the taxi association. But from our interview, we learned that this was now as big an issue as only 25% percent of the weekend market share went to Uber drivers. As the representative said, "In the whole scale it actually wasn't that much, drivers said they could see a decrease in revenue on the weekends."

Which means that there was a lot more media coverage than their market share should have dictated. Although the media coverage was very negative and even involved statements from the Danish Taxi Association, the association proclaims to be open to Uber and other innovative services, provided everybody can compete fairly on equal terms.

## IBM Customer Innovation Center (CIC)

Although we had a quite solid understanding of how Bitcoin works, Hyperledger was rather new to us, and we were pleased to get an interview with a consultant from IBM CIC in Copenhagen.

The consultant confirmed, what we had already learned about Hyperledger and the Certificate Authority for account management. The questions around this topic led us to research the Access Control Files and led us to more specific and useful Hyperledger (2018a) documentation, that further validates the feedback received. In addition to this, the consultant also mentioned how modular Hyperledger is, and named the possibility of integrating with another ID system to authorise access to the blockchain.

Hyperledger (2018b) can easily integrate with third parties that use the OAUTH2.0 authorisation protocol. Whether the proprietary Danish NemID authentication system supports this is unknown. We were unable to get an interview with NETS-NemID and found no mentioning of this on their website. However, even if NemID does not support it directly, a

third party (Auth0, 2018) might still be able to act as intermediary for integrating with NemID.

We also touched on the topic of GDPR during this interview, though no solid statements were made by the consultant. Privacy, in general, is made possible by channels that can include different organisations and people that can see the data intended for them. For GDPR itself, we use the public LinkedIn post by Arne Rutjes (2018), who has a background as a blockchain engineer with a law degree and also works for IBM CIC in the Netherlands. Encrypted personal data is still personal data, that stands clear. But he is less sure about a hash and explains that the GDPR working party and courts might still qualify a hash as personal data because you can technically brute-force a one-way hash even with a secret salt included. So, the question is really how relaxed the courts are about this matter, considering a reverse lookup of the original data is possible in theory, although computationally infeasible.

From a business perspective, the consultant clearly stated that being unable to represent the official opinion of IBM. No comments were given if IBM would participate in a possible public tender. It is our opinion that SKAT is definitely struggling, and therefore we assume that IBM might be interested to help. In regard to the implementation, the consultant suggested that it would make sense for a consultancy company or an IT vendor to build the system in collaboration with the participants. Daily administration should be done by an IT vendor, not necessarily the same as the ones that help implement the system, in collaboration with some technical experts from SKAT. Governance and ownership were attributed to everyone to a certain extent, but several options and combinations are possible, and no concrete suggestion was made.

## **Open banking expert**

As a proxy for Danske bank and Nordea, we interviewed an open banking expert, who is the Vice President of Ernit, founder of FinBot and co-founder of APIs CPH. He has experience with Spar Nord Bank PSD2 API implementation and has connections in Nordea working on PSD2.

The interviewee believes that banks most likely would not cooperate in the proposed conceptual model. The pain points are situated with the bank having to send out data. First,

the bank would have to invest in additional resources in compliance teams and development. Second, a bank would prefer that information requests are sent and then processed by the compliance team, and if the request for the information is compliant, then it would be shared. Considering the PSD2 infrastructure being built, it would be better for another party to initiate the financial flow and submit this with the underlying data flow to the blockchain. By doing so, one no longer needs special cooperation of commercial banks.

The banking experts focus was on pure revenue registration without automatic taxation as SKAT primarily needs to know how much a producing user has earned. Hence, he suggested looking into NemKonto and Danløn because these organisations have experience in dealing with salary information and payments. Potentially they would be better suited to take care of the platform producing user. Alternatively, the platform company itself could provide the necessary reporting.

#### Uber

We also interviewed the public policy representative for Uber in Denmark and Norway. The interview not only helped understand how Uber works in general, but also gave insights to their mindset when launching a new service or entering a new market. Most of all, it was a valuable insight into how a platform business conducts business in Denmark and how they have managed to operate here. To illustrate with our conceptual model, we assumed that card payments would flow through Nets. Instead Uber uses modern payment service providers like Tradeshift and Braintree to receive payments from the passengers and pay the drivers.

Uber stopped in Denmark in April 2017 but is working on a comeback. From the interview it seemed that Uber is willing to consider various technical solutions for their return and as the representative mentioned, our blockchain based system could be one of them. Equally viable from their side would be an API-based system or even a simple protocol of them sending the needed information to the government in the form of an Excel file. They are flexible and have the resources and the experts to cater to most solutions.

However, reporting income is not the only problem Uber has. There has been a lot of outcry about Uber's other aspects around employment and foul play. The latter was the main talking

point for the Danish Taxi Association, where they were concerned that transportation service without seat sensors would lead to the drivers cheating the system. This is something that Uber is actually not worried about at all. As the representative expressed, it is in Uber's own interest to ensure that drivers do not cheat the system. It is not only the Danish government losing money on piracy, but their company as well. Due to this, they have developed a range of safety mechanisms. Among others there are algorithms analysing usage data to find frauds and in some countries, they require facial recognition before starting to use the app.

Although the opinion of taxi associations is important, Uber actually does not think of itself as a transport company, but rather a technology company. They do not provide localised transport services, but facilitate transport and handle the payments. Furthermore, they are putting an increased focus on transportation of goods such as food instead of merely facilitating the transport of people. An understandable decision considering they have a highly functional infrastructure and service, but usually get pushback from an outdated way of thinking about personal transportation.

When Uber first started, they were very much the rebels who wanted to change the current system; their focus was on disrupting the status quo, without local compromises that would complicate their global scaling process. As time moves forward, so has Uber. As the representative mentioned, they still want to disrupt the market, but now they are also trying to fit in legally. The rule to fit in from Uber's side is simple: they can adapt to most scenarios, as long as they are on equal grounds and the change is mandated by law. If it is not, they might be implementing something that they cannot implement in another country, which would ruin any chances of streamlining the product. Mandation by law only works partially though, as a government in the EU can also enforce regulations on an organisation if they have a local office present in the country. This means that the relationship in a way needs to be built on trust - after changes have been mandated, the company in question would then also need to accept and use the regulations.

We also discussed the possibility of adding a transaction fee to our model, the representative was clearly against the transaction fee in the model, but said that the company would be willing to take on an extra administrative IT reporting requirement.

## Danish political expert

To understand how the Danish government and parliament could potentially react to our solution, we interviewed someone knowledgeable about the Danish political spectrum. He has organised Bitcoin meetups in the past and used to be a member of the Executive Board in the political party Liberal Alliance.

The political expert stated quite clearly that he has no professional expertise with blockchain, but a rather strong personal interest and that he is more of an advocate to the general ideology. He gave no technical objection to the blockchain solution, but pointed out that due to the PSD2 changes a more adequate reporting mechanism would soon be possible due to the possibility for companies to interact with banks accounts.

There are various aspects to take into consideration from a political-legal perspective when introducing a system similar to ours. As we learned, most politicians would not understand this blockchain conceptual model. They would rely on lobbyists to educate them on even the basics. The learning process would be time-consuming and slow down the entire process. Our talk also touched on some other solutions, for example, an API-based system would make a good alternative. He even suggested simply having people register with their CPR number and build an automatic A-skat registration on that.

Both versions would be easier understand to the politicians in charge and would require less of an investment from the government. In general, he noted that the focus should be on getting hooked into the financial system and make everything easier and more fluent for everyone. If the focus is just on paying taxes, then the left side of the political spectrum will want it more than the right. Potentially the far-left and far-right would be worried as they do not favour too much surveillance.

We learned that government participation for Liberal Alliance, a party that can be considered the most pro-platform, leads to severe compromises to get support from other political parties. This support is needed for the minority groups to push things through parliament. Presently the compromises come down to support from either the Social Democrats or Danish People's party, as they are currently two of the most powerful ones. Both parties have a voter base with traditional employment to protect, in other words, at least one of these big parties needs to be pleased.

Another thing, that works in accordance with the former, is the Danish golden way. There are parties that will always fight for the old reliable Danish way and will never lower what they perceive as the golden standard on it. From a labour political point of view, he pointed out that left-wing parties would expect taxation and benefits to be similar to the current system with regular employees. Maybe as the most important part in the political viewpoint is the predicament that any system introduced with the purpose to replace another, needs to be not just better, but significantly outperform the old system, for it to be taken into serious consideration. The expert said this to be one of the golden rules in multinational corporations, but that in his experience it adapts well to governments.

From a business viewpoint, the interview uncovered a perplexing problem that would also slow down the developmental process. Most parties welcome innovation and better systems, but only if they come from smaller local organisations that do not threaten the status quo. Multinational companies are feared, as they might take funds away from the country and might not comply with local legislation. He also pointed out the business opportunity for a company to offer services based being able to aggregate bank account data.

## SKAT

We also got the privilege to interview two employees of the Danish tax authorities. One works with interaction design and the other is a developer focusing on blockchain technologies.

SKAT continuously investigates new technologies and concepts. Although not actively used, there are several innovative projects running on the back-end side of SKAT. The interviewees mentioned that they have projects and workgroups for APIs, machine learning and blockchain. They do not need to be at the forefront of technology but want to make sure they are always ready for changes when the political actors make a decision. From a purely technical perspective, both were positive about our disruptive blockchain solution and would love to see it happen in real life. Unfortunately, due to the below mentioned political reasons and legacy infrastructure, they do not see it happening in Denmark any time soon.

Instead, an incremental improvement with API-based system reporting would be more compatible with the current systems. The only concern one of the interviewees did express with APIs is that they should still be easy for stakeholders to implement. But for SKAT to offer APIs on their servers and write accompanying documentation for companies to implement, a decision and accompanying fund allocation needs to be made by the government.

Political actors are beginning to understand the need for change. We learned that the tax council (Skatterådet) has decided that SKAT can get all the information of five labour platforms from 2017 to check if people are correctly reporting their taxes. There are also a lot of negotiations within the government about different platform taxation models, but no conclusions have been reached. The interviewees also expressed that they personally would welcome a third employment type for the producing user of platform businesses as they see this area expanding further. The interviewees confirmed our vision that blockchain by itself is not enough to pay the right amount of taxes. As described earlier as to why we opted not to include VAT, the current laws and regulations are very complex and not suitable for full automatic attribution by a blockchain system itself.

Regardless of how the system will be built, SKAT mentioned that it should happen as a collaboration to ensure that the needs of each stakeholder are taken into consideration. Especially as blockchain technology is not necessarily mature enough and people would be afraid to implement this kind of system. As they also expressed, *"The thing with blockchain is like: Who goes first? I don't think it would be SKAT. I think SKAT would have to see other people like banks or someone else do it first."* Understandable logic, as a highly bureaucratic governmental organisation might not be the place to try out innovative technologies.

The interviewees expressed that our concept would be a lot easier to implement in a country where the infrastructure is bad or non-existent and could be implemented with less resistance. The motor registry blockchain project with transferring and tracking of car ownership was given as an example of a potentially better solution, though not able to compete with existing infrastructure. Finally, the blockchain developer expressed that he can see a lucrative business case for a company that would map CPR numbers to blockchain accounts. This would benefit all parties involved, as producing users could more easily report their activities and SKAT would have a clearer overview. NETS could perhaps do this as they already manage the nation's identity system NemID.

## Danish Central Bank

A request for an interview was sent to Danmarks Nationalbank (DNB), but this request was denied. Because of the importance of DNB in the conceptual model, we use an interview substitute in the form of a recently released document by Danmarks Nationalbank (2017) on the topic of issuing Central Bank Digital Currency (CBDC). We initially missed this document in our literature review as it was only published in December 2017, it deals with the matter of issuing digital currency on a national scale to be used directly by businesses and households with all the resulting consequences.

Our proposed solution and conceptual model are actually designed to avoid businesses and households interacting directly with the central bank. So, we purposely came up with a solution that avoids the big topic of challenging fractional reserve banking and systemic bank runs in crisis situations mentioned by DNB. Nonetheless, some of the arguments used by DNB against issuing CBDC are applicable to our limited back-end version of CBDC.

An argument, that was repeated in our later interview with Aryze, was that issuing CBDC could possibly entail to a whole array of extra expectations that the central bank would be ill-equipped to deal with. Relevant for our case is that the central bank also vaguely considers GDPR a challenge, particularly on blockchain. Another interesting reason mentioned by DNB not to issue CBDC is that it may not be able to satisfy additional user expectations, for example in providing services that interact with CBDC.

This could on its turn lead to a damaged credibility to its core tasks of ensuring financial system stability and stable price levels, and result in pressure from the media and politicians. DNB considers that the drawbacks by far outweigh the benefits. Denmark has a good

payments market with private sector players competing and innovating. Open banking with PSD2 will further aid in the innovation process.

The important lesson learned from this document in combination with the interviews from Aryze and MobilePay is that it is easier for the private sector to innovate and build upon and interact with risk-averse traditional financial institutions. Interestingly, DNB does mention that the entire weighing of benefits and risks of CBDC might be different in countries with a less well-developed payments system. DNB also indicates to follow-up on the matter, especially if other central banks would implement CBDC.

### Aryze

Aryze is a Danish financial technology (fintech) start-up aiming to offer E-kroner, a digital currency with a 1:1 full reserve backing of real Danish crowns. By doing so they aim to offer a stable and secure mobile payment solution platform on which other applications can be built on, in other words, currency as a platform. We interviewed the CEO and CFO. The CFO also published a blog post a few days after the interview (Nielsen, 2018). The blog post is in alignment with the discussed central bank publication and serves as a validating reference to the interview.

Aryze is a young start-up and does not have the technical infrastructure in place to realise their idea. Aryze's CEO has been working in the blockchain sphere for several years and used to be the head of the innovation lab in Coinify, a well-known cryptocurrency payment provider and broker in Copenhagen. He explains that the choice for a technological platform is not easy, because the sphere evolves so fast and is not consolidated. The priority for Aryze seems to be determining the legal requirements before trying to get funding for the development of the actual platform.

When discussing our proposed solution, no negative feedback was received on the technological feasibility of a blockchain solution. Though some concerns were expressed about the ability of SKAT to set a correct taxation percentage in the smart contract. But this is also an existing problem with current systems, especially when one has income from different sources and deductible expenses. In this sense, it was not a critique of our suggested solution.

If anything, blockchain financial flows from non-regular employment would be mapped immediately by SKAT. Hence, increasing the opportunity for SKAT to be able to provide more accurate estimates. The producing user of a platform business would also be incentivised to immediately report deductible expenses to avoid paying too much tax throughout the year.

On a political-legal front, Aryze is currently working out all the requirements it needs to meet concerning financial legislation, KYC, AML and GDPR compliance. GDPR was briefly discussed, similar to previously held discussions. It is unclear what one exactly can or cannot do in the context of blockchain. To quote the CEO: *"GDPR does currently not match the future of distributed data."* The often-heard criticism of GDPR being created only for centralised actors storing information thus surfaced here as well. We got the impression that Aryze is looking into the matter and will try to avoid storing personal data in a blockchain.

On a different topic, the way how Aryze intends to create their digital Danish currency is quite intriguing. The Danish crowns used to back their digital currency are intended to be held both at commercial banks and in safe government bonds. Government bonds are guaranteed by the Danish state and central bank, which are considered extremely safe. The intention is to keep as much money as possible in safe government bonds; this would accrue a small interest and reduce the exposure to commercial bank bankruptcy.

This plan thus entails a partial bypassing of commercial bank risk and central bank resistance to digital currency. Not only would Aryze minimise the risks of a commercial bank going bankrupt, they would also de facto offer a liquid digital currency that is safer than regular currency held at a commercial bank. Note that this was one of the key reasons for the central bank not issuing a CBDC. So, if a new financial crisis would occur, the question begs how many individuals and especially (European) corporations would try to flee into this haven and how resilient commercial banks would be against the loss of capital and resulting ripple effect.

From a business perspective, Aryze argues that central banks and state institutions are not tech companies. It requires a very agile tech environment to stay on top of the latest technological solutions. The business plan of Aryze seems to be one of a platform business, with a two-sided market of consumers and businesses. The initial challenge is to get a customer base and later on charge the companies that want to receive money from consumers. When discussing our proposed solution, Aryze did not support the charging of an individual transaction fee and instead suggested a subscription model. For example, a developer subscription for businesses and SKAT, thus similar to what iOS developers have with Apple.

### **MobilePay**

MobilePay has existed since 2013 and was the pioneer in Denmark to offer a mobile payment solution. Nowadays, MobilePay is also expanding in the domain of digital identity solutions. We interviewed an employee who started working for Danske Bank in 2009 and afterwards MobilePay in 2015. The interview provided insights into the world of both payment service providers and traditional banks.

From a technical perspective, the interviewee had some knowledge about blockchain and smart contracts. The interviewee was not against the blockchain solution on a technical level; however, considered APIs a lot more feasible for SKAT and traditional banks to implement.

From the political-legal and business angles, the following quote sums up the non-technical feasibility of the blockchain solution: "I have a hard time seeing in the near future that it can happen in real-life with all that technical legacy that has been built up in our society. Something like this will definitely fly much better in non-developed countries where you don't have all the legacy to incorporate."

The interviewee also said there is a need for a simple service for a person earning money in the sharing economy to just report taxes, handle insurance, pay into vacation days and pensions funds. Not necessarily a new employment class, just a way to make it all work.

Most of the interview was spent on the business side of using APIs in a PSD2 context. The interviewee explained that MobilePay's transaction costs are being reduced by circa 98% when no longer reliant on credit card infrastructure to move money, thus instead rely on interacting directly with bank accounts.

In 2017, there were articles, e.g. Børsen (2017b), about a cooperation between MobilePay and Skat. The interviewee told that the media largely exaggerated the extent of the cooperation. MobilePay simply shares knowledge with SKAT. By no means should this cooperation to be interpreted as MobilePay becoming an extended monitoring arm of SKAT. The interviewee stressed that if SKAT were to offer an API, then MobilePay would look into a self-reporting functionality for users.

As for automatic reporting and monitoring, the interviewee finds it more appropriate for SKAT to receive the revenue data directly from the platform businesses as they are the source of that data regardless of the payment methods. In addition to this, and more related to the reporting of expenses, banks could also scan accounts and offer self-reporting. The interviewee pointed out that it does not make much sense for a payment service provider to report when different payment methods are used. At the end of the day, all payments end up on the bank account anyway.

As an interesting twist, the interviewee mentioned that there might be a business opportunity for a new company to scan bank account statements and help users report to SKAT. The interviewee thinks this could be done better by a new company as opposed to a traditional bank offering a similar service. This would be more efficient compared to banks developing parallel infrastructures.

## Meploy

A short interview was conducted by phone with Meploy's CEO. Meploy is a labour platform that has turned a temp agency into an app. Employers in need of temporary staffing hire an employee through Meploy for a certain number of hours or days. The producing user is paid per hour, as opposed to per assignment with Uber and other labour platforms. The producing user does not need own capital resources either, as opposed to Uber drivers requiring a car. These factors make Meploy a clear legal outlier amongst other platform companies, but interesting to discuss as a precedent for just paying producing users as regular employees.

Meploy made no mention of ever hiring self-employed subcontractors; we presume they avoided doing so to avoid being accused of working with fake self-employed subcontractors.
Meploy previously used B-income, but for several reasons switched to paying the workers as temporary employees instead. The CEO stated that one cannot employ someone on B-income for more than eight hours per week on average. Meaning that a client company was not able to hire someone for more than a week.

Secondly, the companies preferred not to include the temps on B-income in their yearly statistics. Although not specified in the interview, we suspect that companies preferred to remain under certain threshold levels that would otherwise lead to additional time investments and costs. All-in-all, it made more sense for Meploy to employ the producing users themselves and take care of all formalities. The client companies simply pay invoices to Meploy and do not have to worry about anything else.

In regard to our blockchain solution, no technological feedback was given. However, on a political-legal and business level, the CEO pointed out that third parties can handle salary payments as long as the handling fee is not directly deducted from the pay-out.

Meploy's CEO further elaborated that he is advising SKAT on how to use APIs. He explains that nothing has been decided yet. His advice is to have the producing user login on a SKAT website with NemID and let the users decide which platform companies should relay earnings and other data like the number of hours worked to SKAT.

#### **Overview of interview feedback**

Below is an overview of each interview and the proxy document for the Central Bank. We listed the most important feedback in the three feasibility categories.

*Table 6: Overview of interview feedback* 

	Technological	Political-legal	Business
Dansk Taxi Råd	/	Complex and rigid taxi legislation, strongly influenced by lobbying.	Uber helped push the industry. There is a lot of innovation that could happen in the taxi industry. Open to competitors on a level playing field.
IBM	Blockchain / Hyperledger assessed as technologically possible. Advanced user account management is possible on Hyperledger.	GDPR: could be a problem, unsure Security: at least as secure as other solutions Privacy: channels allow that only the right people or organisations see the right data	Gaining more experience for IBM. Involve all actors that build value in the system.
Uber	Willing to consider many solutions, including blockchain and API-based reporting.	The focus in the past was on scaling without making local compromises; now the focus is on being compliant with local legislation.	No blockchain transaction fee. Uber sees itself as a technology company, and plans to add services that are not personal transportation.
Open banking expert	Blockchain maybe possible, but easier to setup API reporting system	/	Commercial banks are probably unwilling to provide special infrastructure and participate in blockchain solution. Use another party to send data to blockchain and initiate financial flow. Consider reporting via existing actors like NemKonto and Danløn.
Central bank	/	Inferred: falls outside scope of the central bank. No cooperation should be expected.	/
Danish Political expert	PSD2 change allows for more adequate reporting mechanisms.	Most politicians do not understand the basics of blockchain; would require lobbyists to educate them. For broad political support, the focus cannot solely be on taxation. API-based reporting requires less political investment.	Business opportunity to offer bank account data aggregation service.

Aryze	No technological bias, blockchain is an option, also open to other technologies.	GDPR: unsure, avoid blockchain Use Danish crowns held at commercial banks and governments bonds for 1:1 token pairing.	Private fintech companies better suited for innovation Against individual transaction fee, in favour of app developer like subscription.
SKAT	Positive about a blockchain-based system, also open to other technologies and proactively preparing for changes.	SKAT is in a constant twilight stage waiting on decisions from the government, even if they are capable to adapt blockchain solutions, it is too new and disruptive compared to an incremental improvement with APIs.	Potential business case for mapping blockchain accounts to national identity.
Mobile Pay	Probably possible, but not for a Danish bank and SKAT. API- based system preferred.	Danish legacy based system too cumbersome for blockchain project.	No automatic API reporting to SKAT. Only self-reporting by platform company and bank. Potentially via a new company that specialises in scanning bank account and reporting to SKAT's API.
Meploy	/	Can be necessary to simply employ people. Nothing decided yet in SKAT.	Let producing user decide on SKAT website which platform company data should be pulled in.

## Revised stakeholder map

The interviews provided valuable information that helped to revise our used models. We constructed a stakeholder map earlier based on desk research, which we will now improve on based on the information gathered from the interviews. Instead of going through all the stakeholder once again, we will mention only the most significant changes to the earlier model.





#### Blockchain platform providers

Initially, we set blockchain platform providers in a low interest and low power quadrant. We initially thought they would not have much interest due to the small business implications and their ability to influence the characteristics of the system in a significant manner. After hearing the interest of both Aryze and IBM, we realised that this kind of system would be a significant milestone for blockchain-based solutions proving their usefulness in the public sector. Therefore, we moved them towards the high interest side.

## Tax authority & political parties

We consider the Danish tax authority SKAT as the main entity that could make or break our suggested solution. As we learned though, SKAT is heavily reliant on the decisions of politicians. Development wise SKAT is ready for various possible changes that could improve the Danish infrastructure, but due to debates and political lobbying, SKAT is often set on standby. Due to this their power and interest on the stakeholder map were reduced and the interest and power of political parties were increased.

### Central bank

Unfortunately, we were unable to interview the Danish Central Bank, but from other sources, we learned that they would have far less to do with our solution than initially speculated. Power wise they still stay above the halfway line, but due to their small involvement in the overall process, we lowered their interest in this project. As long as Danish legislation is adhered, the central bank should not have too many objections to the implementation of this model.

#### Taxi associations

We also significantly raised the taxi associations interest level on our stakeholder map. The taxi association is an existing actor that has quite successfully exercised their lobbying power in the past. Our proposed solution would help strengthen the competition within the personal transportation industry, which could make the taxi association a strong opposer if they continue to represent the interests of the existing industry.

# Revised conceptual models

Throughout the interviews, it became clear that blockchain is not feasible from a politicallegal point of view. Therefore, we will elaborate both on an improved blockchain conceptual model and on a more realistic API-only alternative. Before doing so, we will first describe the elements common to both models.

### **Common elements**

## Details about underlying economic activity & enforced reporting

Merely knowing a producing user's total earnings is insufficient for SKAT to attribute financial flows and tax correctly when a platform provides both capital and labour revenue. SKAT needs to know the details about the underlying economic activity to attribute earnings into the right tax categories.

Other state agencies will also be interested in the underlying economic activity. This interest could be on an aggregated basis to do statistics and gain insights into to activities in the platform economy. The interest is also present to check if an individual needs to pay back unrightfully claimed social benefits. Especially for the latter purpose, politicians need to decide if they want to rely on self-reporting by users or if they want to enforce reporting by platforms.

When enforcing, a decision also needs to be taken on the time interval. If politically digestible, we at minimum recommend an enforced monthly API reporting by platform businesses considering most social benefits are paid out monthly. In the case of our proposed blockchain solution, SKAT already has direct access to every pay-out and underlying details. SKAT indicated that the current taxation rules are very complicated. Automatic attribution and taxation based on the underlying economic activity could be too much for SKAT to handle. Politicians might need to introduce simplified taxation legislation for the producing platform users.

#### **Overview of revenue and deductible expenses**

As illustrated by the political expert and our literature review before, the focus should not solely be on more taxation. A broader focus is needed on stimulating growth in the platform

economy. A vital part is to ensure that producing users can also easily deduct their expenses without having to worry about complicated accounting and legislation.

To facilitate easier expense deduction, we suggest that SKAT extends their website so that the producing user has an overview of what has been reported and what deductions are possible. For example, it should be easy for SKAT to automatically grant some expense deductions to drivers based on the driven kilometres, considering SKAT would have access to this data.

# Revised blockchain conceptual model

The blockchain conceptual model was created based on the literature review and evaluated by stakeholders during the interviews. Based on this feedback, a new revised model is shown below in Figure 10.

The original model has been discussed in-depth earlier. Therefore, this section only elaborates on the differences with the revised version. Based on the feedback from the interviewees, we decided on the changes below. The reasons for implementing these changes are derived from the earlier interview section and will be elaborated on in the discussion section further on.



Figure 10: Revised blockchain conceptual model

#### Three major changes to blockchain model

First, the commercial bank and central bank DKK-cDKK swap have been completely replaced by a fintech company willing and able to fulfil both roles. This fintech company would thus interact with the blockchain platform and maintain accounts for the platform companies, producing users and SKAT. Although Aryze currently does not have a technical infrastructure nor agreement with a blockchain provider in place, Aryze could become a prime candidate for this role in the future. Second, the involvement of commercial banks has been drastically reduced to passive actors only receiving money from accounts situated at Aryze. The platform company now has an account at Aryze which it can use to pay the producing user and send a detailed overview of the underlying economic activity to a database at SKAT. Third, the intransaction fee has been removed to avoid usage barriers, complexity and potential legal issues.

### Additional considerations

Considering that payment service provider Tradeshift is also a premium member of the Hyperledger project (The Linux Foundation. 2018), there is a potential for Tradeshift to not only act as a payment provider but also fulfil the role that is currently assigned to Aryze. When looking at the overall future of Aryze, it is unclear if Tradeshift would act as a complementor or as a direct competitor. Considering Tradeshift is already an established player on the financial market with involvement in Hyperledger, they would stand a better chance to win in a public tender.

Regarding the financial flow, the platform company's commission does not necessarily have to run through Aryze. That money could be sent directly from the payment service provider to the platform company's bank. However unlikely it may sound, if the European Union and Danish government would introduce a corporate revenue flat tax, then Uber's commission could even become part of the smart contract processing.

## API conceptual model

For an API reporting solution, we advise politicians to give SKAT the assignment to first develop an API reporting infrastructure that can receive detailed data describing the underlying activity directly from the platform companies.



*Figure 11: Recommended API-based conceptual model by platform company to SKAT* 

Platform companies are the primary source of truth and can provide the most detailed information about the economic activity underlying the financial flow. A single payment service provider only sees a part of the financial flow, a bank has an overview of all financial flows, but neither have info about the underlying economic activity. Therefore, and partly against the government's original plan (Erhvervsministeriet, 2017, p. 46), we do not recommend reporting via payment service providers nor banks. It would only make sense for a bank, or better, a third party having access to accounts at all banks, to do such enforced scanning and reporting to SKAT as a control measure. Such a control mechanism might be necessary if too many non-compliant international platform companies operate on the Danish market.

### Revised models summary

To summarise, we understand that the original blockchain based idea was not feasible and would instead opt for an enforced API reporting system. We would also aim for a more broader approach that would stimulate the growth of the platform businesses. This could be done for example with an extension on the SKAT website to facilitate easier expense deduction. We also found alternative stakeholders to the concept, for instance, Tradeshift could take the place of Aryze as the fintech company.

To the actual model, we made three significant changes. The involvement of a central bank has been replaced with a fintech company; commercial banks have been reduced to passive actors with minimum contact; we removed the in-transaction fee to avoid various issues.

# Discussion

As stated in the methodology, we would only asses a blockchain solution feasible as a whole if feasible from all three sub assessments which are technical, political-legal and business. Unfortunately, blockchain is not overall feasible due to the countless political-legal challenges. Below we summarise and discuss the most important practical and theoretical implications learned from doing our feasibility study.

# Technological feasibility

Our research confirmed the choice for Hyperledger blockchain technology and IBM as a blockchain provider. However, IBM was the only actor knowledgeable enough about this particular topic amongst all the interviewees. We expect that Hyperledger will be used a lot for non-public blockchain implementations based on the literature review, IBM CIC feedback and increasing industry support for Hyperledger. A proof of concept should be made to practically test the required functionality to increase the validity of this finding. As a practical contribution, we suggest considering Hyperledger as one of the first choices when designing a private or state blockchain project.

Regardless of the blockchain feasibility, API reporting is an established way for different parties to communicate data and much easier to implement considering APIs are commonly used and do not involve a financial flow of automatic tax pre-collection.

# Political-legal feasibility

As a contribution to the blockchain design science research knowledge base, we suggest to avoid using blockchain in a public setting, especially when existing legislation and behaviour needs changing.

Introducing a new disruptive technology like blockchain is especially difficult in the public sector where politicians often lack basic technological understanding. The distributed nature of blockchain and immutability can also be perceived as threatening. An incremental API reporting solution requires a smaller political and financial investment.

API technology has been widely used for about two decades and is merely an easy to understand communication protocol. The proposed disruptive blockchain solution simultaneously contains a financial flow and data flow, thus leading to more affected stakeholders and legal changes.

### Need for a political majority

Regardless of the chosen technology, a political majority is needed to change existing legislation or demand new reporting requirements. As a practical implication for our project, this entails that the focus cannot solely lie on taxation and enforced reporting in the current political climate. Better expense deduction should also be a part of the overall solution to aid the narrative of digital economic growth. The general lesson learned here is that any suggested solution requiring a legislation change should be marketable to a political majority.

### Irrational self-reporting preference

Interestingly, a surprising number of interviewees showed a preference for self-reporting as opposed to enforced reporting with a blockchain or API solution. Although we fully respect the views of our interviewees, relying on self-reporting when designing a new taxation solution is de facto designing a solution that will not work. Based on the literature review and the specific case of large-scale inaccurate reporting by Uber drivers, one has to admit that the producing users of platform businesses should not be responsible for reporting.

We speculate that interviewees' personal views on this matter are influenced by several factors. Danish society is generally characterised as a high trust society. The current political parties in power favour less state intervention, thus self-reporting is more politically digestible. From a bird's-eye view, there are roughly three distinct major actors in terms of reporting responsibility: producing users, platform companies, and the state (government and SKAT). Up until now, the responsibility and blame have been put on the producing users.

Our suggested solution would shift a large part of that reporting responsibility and thus possible blame to SKAT; considering SKAT needs to define what data they want, set up the reporting infrastructure and do the taxation calculations. This is a complicated and resource demanding task. This game of avoiding the hot potato would explain the preference of many interviewees. Another reason could be that by relying on self-reporting more responsibility

and cooperation is demanded from the producing users and platform companies. This makes sense from an incremental implementation point of view, in which self-reporting by the producing user facilitated through platform companies functions as a lead-up to enforced reporting.

### Industry-specific legislation and lobbying

There are also the specific industries that companies and individuals operate in. Solving the general taxation problem, will not allow a platform company like Uber or Lyft to enter the Danish marketplace due to the recently 'modernised' industry-specific taxi legislation that still requires physical seat sensors and a taximeter. There is no technical need for such outdated requirements; we deem this to be a purely a political lobbying issue.

### Privately issued digital currency with full reserves

The 'be your own bank with full reserves' ideology behind blockchain cryptocurrencies is regarded as a threat by Central banks to the established financial system using fractional reserve banking. This common central bank attitude was also valid with the Danish central bank and led to its replacement in the conceptual model. The Danish central bank needs to be completely bypassed by a private sector fintech actor like Aryze that issues tokens with full reserves held at a commercial bank or invested in government bonds.

As a generalisable finding, when a blockchain solution requires a token having 1:1 fiat currency pairing, central bank cooperation should not be expected. Instead, one should find a private sector partner and investigate the legal requirements. As we are not lawyers, we cannot confirm that this concept is currently legal in Denmark and which legislation needs to be adhered to with a 'digital currency'. Regardless of the legality, this concept would still be problematic in countries having a weakened financial position such as many in Southern Europe.

#### **GDPR**

Storing hashes of personal data on an immutable blockchain could be a legal issue, but nobody is sure. The only somewhat qualified answer we got on this potential GDPR issue was from IBM CIC (Rutjes, 2018) and indicates that this determination might need a court ruling. To add to the complexity, a dispensation of the standard rules might be possible considering the taxation purpose in our case.

### Business feasibility

Overall, we determine a blockchain solution to be feasible from a business perspective. If approved by the government, SKAT could get the necessary funds to issue a public tender to outsource large parts of the development and infrastructure. Below are some additional business development insights.

### Transaction fees

The exact pricing model is debatable. However, a practical and generally applicable finding is that the in-transaction fee logic from a public blockchain should not be copied to a private or state organised blockchain. Our mistake with initially charging 1 crown per transaction in the conceptual model originated in the idea that the system should become self-financed upon mass adoption. However, the interviewees including SKAT itself believed the state should provide funding.

As a generalisable finding one should remember that an included transaction fee within the transaction generates a direct usage barrier and complicates accounting. A new financial service provider is inherently a platform with sending users and receiving users. Based on the feedback from MobilePay and Aryze, it makes most sense to initially charge no fees first, to build a user base and later make the receiving users pay.

## Involve few and small stakeholders

When designing a blockchain solution, one should try to minimise the number of stakeholders. A solution has a higher chance of being feasible when reducing the number of actors. The stakeholders are ideally small and open to implementing the proposed solution. In other words, one should avoid relying on active cooperation by bulky private and public institutions. Based on interview feedback, we do not think that the Danish commercial banks will offer advanced PSD2 APIs that could also process data flows in the near future. Therefore, we replaced the commercial banks by a fintech company like Aryze in the revised blockchain conceptual model.

#### Business opportunity for bank account scanning and reporting

The political expert, Meploy and MobilePay all noticed that there might be a business opportunity for a private company to scan the producing users' bank accounts. This could help users to report their platform activity to SKAT. Such a company would be called an Account Information Service Provider (AISP) in PSD2 terminology.

# Conclusion

This thesis used a case study combined with design science research to understand and improve the taxation of producing users of platform companies in Denmark. Uber was used as a case company because of its disruptive impact and numerous problems with taxi legislation and driver taxation.

We conducted an extensive literature review to understand recent innovations within our chosen topic better. An innovative blockchain solution was put forth in the form of a conceptual model. The model explained how the financial and information flow could be restructured with blockchain to solve the taxation issue. The acquired knowledge and model were subsequently tested in interviews with the most important stakeholders. The interviews conducted tested the feasibility of the model from three perspectives: technical, political-legal and business.

The feedback gathered from our stakeholders led to a revised blockchain conceptual model. Unfortunately, using blockchain technology currently proves to be too great a political-legal challenge to pass the overall feasibility test. Therefore, we critically discuss and present our recommendations on the government's recent plan to use API technology.

Although the time is not yet ripe for the public sector to use blockchain, our discussed findings are a valuable contribution to this novel research field. A new array of taxation possibilities emerge when using off-chain data storage of the underlying economic activity immutably linked to an on-chain financial transaction with a hash of that data. If adequately facilitated by the Danish tax authority SKAT, the producing users should no longer have to worry about complicated legislation, accounting and tax reporting. These new possibilities would allow the producing users to create real economic growth by allowing them to focus on their core competencies.

Apart from automatic tax pre-collection, most functionality can be achieved when implementing our recommendations for API reporting by the platform companies. All things considered, we conclude that the government and SKAT should move forward with our API recommendation instead.

## Future research

There are still unanswered questions on the matter of platform business taxation and the adaptability of blockchain technology to existing infrastructure. The answers to these questions might have genuine business value for the right companies and any state struggling with taxation. We believe that our work can be used as a starting base for several research projects described below.

Using blockchain in the public sector for such a big project might remain politically indigestible for many years. From an academic point of view, the next step would be to create an actual Hyperledger based proof of concept. A working model would provide a much better overview to stakeholders and would help to demonstrate the viability of the idea. Hopefully also uncovering new insights in the process.

Our blockchain and API suggestion both lead to SKAT being responsible for interpreting and processing the provided data to tax accurately. On this matter, an in-depth study with SKAT is required to determine what back-end infrastructure SKAT needs to create to deal with the provided information. Such a study would provide added clarity to politicians and involved companies. This would also help SKAT in particular to get an idea of the desired data structure and level of detail they want to receive from the platform companies.

As we learned, one of the biggest hindrances to overcome would be to get politicians to agree and order the implementation of the concept. In a future study, the opinions of the political parties should be better mapped to understand the necessary steps for success. It could be that in reality there is only one party that is firmly against the overall idea and there might be specific reasons to it; reasons that the concept might be able to accommodate.

We mentioned that there are different types of two-sided platform businesses, so a study mapping these businesses active in Denmark and comparing their services and adaptability of our concept would provide a valuable holistic overview. To further test the generalisability, the same concept could be applied to different platforms. It would also be relevant to study consuming and producing users their opinions and understanding of the current taxation system versus our proposed concept. We have expressed that the concept is primarily a back-end improvement without much user involvement, but it could be interesting to see how users' interest in using a platform company changes with the added legitimacy and taxation. Both a quantitative and a qualitative study into user perception could produce valuable insights.

A new business opportunity also deserves further investigation. Several interviewees mentioned that a new service provider could arise that focuses on scanning bank account statements and helping users with income reporting to SKAT. An attractive and potentially viable idea, but there are numerous questions to answer. 'Would the (better) direct API reporting by platforms to SKAT still occur? If so, what is the added value?', 'What are the legal and regulatory aspects around such a service?', 'To which extent should the state be involved?', 'What kind of fees would be charged for this type of service?', etc.

From a different angle, the above Account Information Service Provider (AISP) could be transformed to also function as a Payment Initiation Service Provider (PISP) in PSD2 terminology. By doing so, all platform companies could submit the information flow related to a producing user's payment to SKAT via a single PISP instead. Potentially, part of the payment could be directed to SKAT as a pre-tax collection. This would de facto create a solution similar to our initial blockchain conceptual model, but without a blockchain. These are interesting new alternatives to research.

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