Techruption

Business model options for SSI use cases

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CONTENT

TNO innovation for life

1. INTRODUCTION - TECHRUPTION

SSI IS BECOMING TECHNICALLY FEASIBLE, BUT LACK OF CLEAR BUSINESS MODELS CAN HAMPER ADOPTION

CONTEXT

- Within Techruption several parties are working on SSI use cases. They have great benefits for end-users, such as ease of use and increased privacy and safety. SSI has a high potential for businesses too and could increase efficiency significantly, but also requires big changes in the way of working. Most of the use cases are focused on the related technical challenges and the technological maturity of SSI is becoming high. However, the business side of SSI has not been researched sufficiently yet, which can hamper adoption and scaling.

CHALLENGE

- It is often unclear what the business implications are of adopting SSI for companies. How will their current processes change? What kind of business model will fit this change? Which partners will they have to collaborate with and how? What are the introduction costs? There are not many real-life adoption examples yet from which we could learn, especially not large scale cases. Standard business models for SSI have not evolved yet.

SOLUTION

- In this document business model options for three basic SSI use cases are presented. Changes in the processes and roles within the ecosystem are described, and potential revenue models are presented. Every organization should design their own business model carefully when starting with SSI, but the ones presented here can be used as a starting point and inspiration.

SSI USE CASES
IN TECHRUPTION

Within the Techruption program several SSI use case have been worked on:

- In the subsidy case for the province of Limburg it was investigated how a digital form could automatically be filled out using SSI. Both the controller and the person filling the form out would benefit from the implementation of such a system on a SSI infrastructure. Since it involved a public organization the analysis of economic adoption is less interesting.
- Within certain situations it is often the case that people want to act on behalf of someone else. SSI would require guardianship. In the guardianship use case it was investigated how this could work without handing over the personal digital key. Which is used to encrypt someone's data before it is being sent over the internet. This use case would build upon an existing SSI use case. Therefore it will not be investigated as a use case for the economic side of adoption of SSI.
- Another use is about trusted communication. Within the customer contact sector business have to verify with whom they are communicating with over the phone or in a public chat environment. By verifying each other's identity using SSI both the customer and the service provider could communicate safely, because they are certain whom they are talking to.
- When adoption increases so does the number of credentials issued. Keeping track of the different credentials, attributes and assurances becomes a complex and lengthy process. Within the credential catalogue use case an overview of all credential types was experimented with. The requirements and who would host it were investigated.

SSI USE CASES
OTHER

Other SSI use cases which are relevant, but are not part of Techruption:

- The first use case is the on of the diploma. Here universities could issue the diploma in the form of a digital diploma in a digital wallet. Students could hold these in their wallet and let them be verified by other universities or future employers. The university serves as a issuer, other universities or employers as the verifier and the student as the holder.
- From another program the digital contracts within real estate surfaced because of the tight housing market. This use cases would bring landlords and tenants together on a platform. Both their identity and authenticity would be verified, whereafter houses would be listed and tenants could apply for a house. When both wish to enter a tenant agreement this could be digitally made available through SSI. The tenant and landlord are both holders whereas the platform is the verifier and issuer.
- A more fundamental use case is the identity or passport use case. Here the government or a eID provider could issue a identity to a citizen. The citizen would then be the holder of his own identity in his digital wallet. A service provider, for example an insurer or other public organization could verify the credentials and authenticity before entering in an agreement.
- Finally we have the case of the ultimate beneficial owner (UBO) within the KYC and Wwft regulations. Here a financial institute is required to research the organization it will be doing business with, thereby being the verifier. Especially the natural person owning the business. In simple terms the organization would have to collect all documents indicating who the UBO is. The organization is thereby the holder of the credentials. These are issued by different organizations such as notaries and governmental organizations, being the issuer.

2. USE CASES

THIS STUDY IS USE CASE BASED, THESE WERE SELECTED BASED ON 3 CRITERIA

WHY USE CASES AND NOT "SSI IN GENERAL"?

The goal of this study is to uncover the challenges that could hamper the adoption of SSI and how the ecosystem could overcome these. Looking at SSI with a generic perspective would not surface the specific challenges and would result in results which are too general for practical use. Therefore, to be able to go more in depth and to investigate the economic hurdles that would hamper the adoption, 3 use cases were selected.

CRITERIA

The first reason for a use case to get picked was that it should not need an additional use case. The onboarding process where a natural person would receive a basic credential of identity is assumed to be in place already.

Next, 3 criteria were selected to choose 3 use cases from a selection of 8 from Techruption and other cases known within TNO.

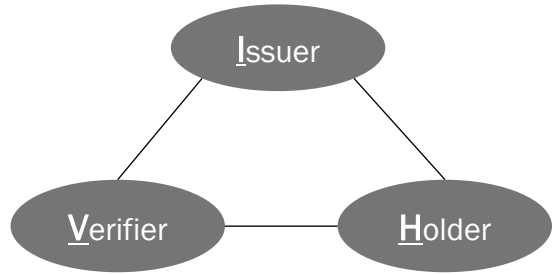
1. The selection of the use cases should be **as diverse as possible on expected benefits per role** (holder, issuer, verifier).
2. A diversity should also exist in the **expected intensity on transactions per role** (holder, issuer, verifier) over the use cases.
3. There should be a **relevant connection with the Techruption program**. The use cases from Techruption should build on the use case or help the use case get adopted.

Based on the above mentioned criteria the **Diplomas**, **Ultimate Beneficial Owner (KYC)**, and **Trusted Communications** use cases were chosen. The explanation for this selection can be found on the next page.

WHY THESE 3 WERE SELECTED

From the analysis of these 6 use cases we have decided to go with the following cases: **Diplomas**, **UBO** (KYC) and **Trusted Communications**.

- **The diploma use case** was chosen, because of the benefit it could bring to the universities, that is the issuer in this ecosystem. An identical scenario can be found within the identity use case. This use case was however quickly taken away, since it forms the basis of many other cases. Besides that it is being adopted by many wallets and will be pushed by the government. Diploma requires adoption from employers, exchange universities and students, and therefore requires a closer analysis to look for hurdles in adoption.
- **Trusted communications** and the digital contracts seem most alike based on who experiences the most benefits and the intensity of transactions. However trusted communications is a use case most related to Techruption. Besides that this use case has not been looked at closely from a economic perspective, whereas digital contracts within real estate is already being experimented with by several small companies.
- Finally the **UBO Ultimate beneficial owner** within the KYC process was chosen. This use case involves lesser transaction, but more complex and bigger transactions, which brings more variety to the 3 different use cases. On top of that, the credential catalogue serves most of the other use cases in their adoption. Therefore it will be taken a long in the final chapter about the conclusions and advice.



Use case	Benefits per role			# of transactions			Relevance
	Verifier	Issuer	Holder	Verifier	Issuer	Holder	
Diploma	✓	~	✓	2	3	1	2/4
UBO (KYC)	✓	✓	~	3	1	1	4/4
Trusted communication	✓	✓	X	3	1	2	4/4
Digital contracts (real estate)	✓	✓	X	3	1	3	3/4
Identity/passport	✓	✓	✓	3	2	1	2/4
Credential Catalog	✓	~	X	2	2	0	4/4
Explanation	✓= yes ~ = medium x = no			0 = no 1 = low 2 = medium 3 = high			Relevance in comparison to the 4 techruption cases

USE CASE 1: DIGITAL DIPLOMA
FOR EMPLOYER OR EXCHANGE SEMESTER

What is it?
In this use case diplomas can be issued and their authenticity can be verified in a digital manner. A student gets a digital diploma in their personal SSI wallet from the university when they finish their course. They can present this digital diploma to other universities if they go on exchange or to potential employers (companies). These “third parties” will be able to verify the authenticity of the diploma without contacting the university that issued the diploma.

How is it done and by whom?
The university and the student both need to be using a basic SSI infrastructure, and their identity needs to be verified as a start. Once the student graduates, the university issues his/her digital diploma as a verifiable credential, which the student can see in his/her wallet app. Third companies connected to the SSI ecosystem can verify the legitimacy of the diploma (if presented by the student) when checking a presentation of it, and save proof that they have seen it.
Main stakeholders:
Student, university, 3rd party verifier (e..g future employer), parties within SSI identity use case (e.g. government, parties providing basic SSI infrastructure (e.g. wallet app, DLT provider)

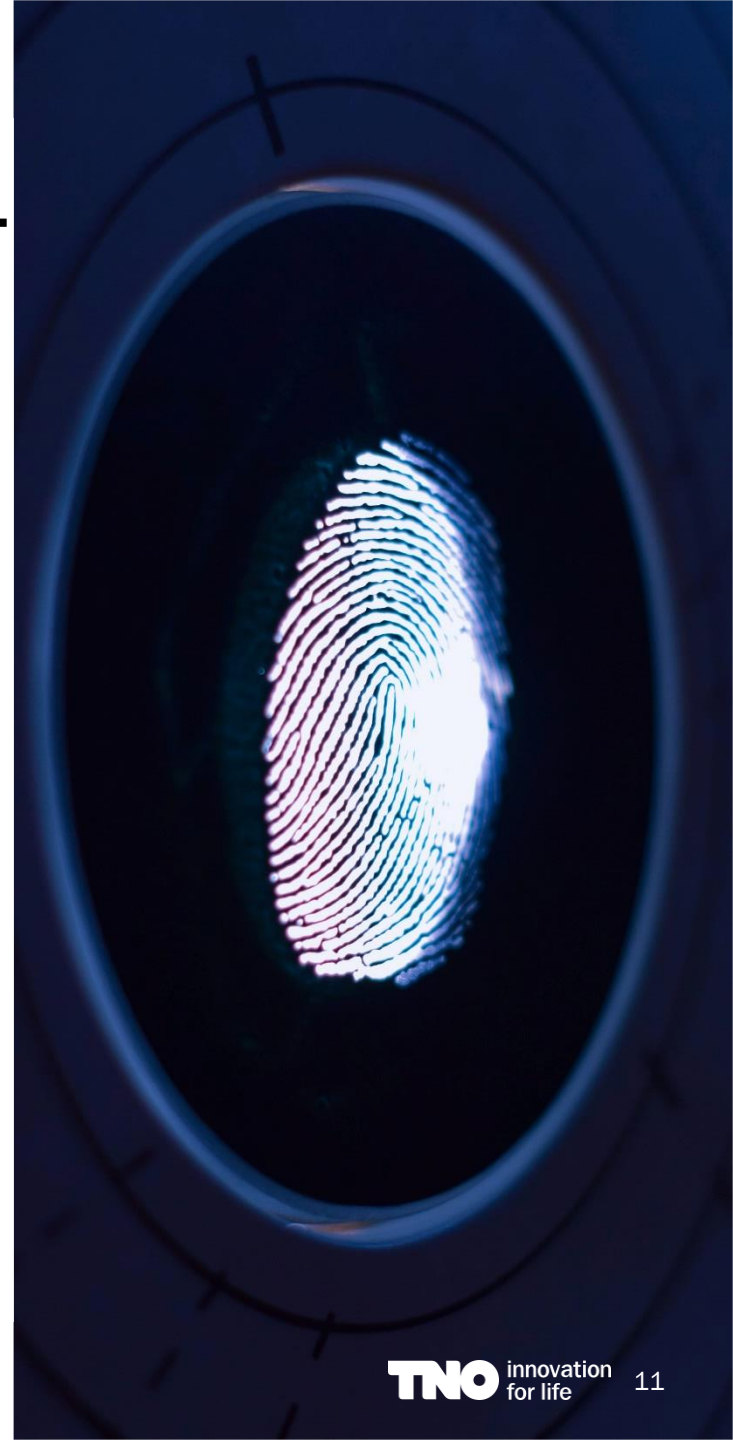
What value does it bring?
This use case brings different benefits for each participant. Diploma fraud will become much less. Students will not have to follow complex beaurocratic processes to apply for exchanges and to prove the validity of their diplomas. Third parties will not have to contact universities to verify the authenticity of diplomas of potential employees, leading to less administrative costs on both sides.

USE CASE 2: KNOW YOUR CUSTOMER (KYC)
FOR ESTABLISHING A BUSINESS BANK ACCOUNT

What is it?
Financial institutions function as gate keeper of the financial system. One of their duties is to monitor who they are doing business with. Therefore they have to verify the identity, suitability and risk of their customer when doing business. Customers are asked by these institutions to provide details about the UBOs (ultimate beneficial owners). Based on the risk profile of the customer financial institutions have to perform due diligence to the correctness of the information

How is it done and by whom?
SSI allows entities (clients) to store the UBO information in their digital company wallet app. When doing business the financial institutions, falling under the KYC regulation requests information about the UBO. Doing this over an SSI infrastructure financial institutions are no longer required to perform an expensive due diligence. Besides, the annual monitoring of alterations is not needed, because the notary issues a certificate of prove that an entity has received new or revised credentials. This certificate of prove is registered by a central organization such as the Chamber of Commerce (CoC). The CoC may also issue a certificate of authority to the notary so that it is eligible to issue credentials.
Main stakeholders:
Entity (consisting of the owner and director/management), Financial institute, Notary, Public data provider, Chamber of Commerce (CoC) and the Central Bank

What value does it bring?
Financial insitutions are required by law to execute their customer due diligence. Currently it is a very lengthy and costly process. It is obligatory to check the information provided about the UBO. By implementing SSI financial institutes no longer have to perform due diligence when doing business for the first time. Because changes to credentials cause a revocation of the original credentials it is also no longer required to do an annual check.



USE CASE 3: TRUSTED COMMUNICATION WITH CUSTOMER SERVICE

What is it?
When a customer is messaging to a company account, their identities are currently not verified. When questions arise in the conversation which need verification, the company will ask the customer to answer a list of personal questions. In this use case, instead, a request for identification with SSI will be sent to the customer. With scanning the QR-code with the wallet app he/she proofs his/her identity to the company. The conversation can continue on the same platform.

How is it done and by whom?
When setting up communications with an organization a customer can keep talking in the same channel while verifying the identity in parallel in a trusted channel. By verifying the customer's identity to the organization and the organization verifying that it is them this safe communication can be established. Within this safe communication the organization is also immediately aware of whom they are having contact with and can adjust their communication accordingly.
Main stakeholders:
Customer, service organization, provider of secure/SSI chat environment, parties involved SSI identity base case

What value does it bring?
The use case is beneficial for the company and the customer both, as it saves time and brings security, lowers the risk of fraud for both sides. The customer saves time by not having to answer the personal questions again and again at each interaction, and the company saves time by not having to ask them, which because of the scale (large amount of customers they are talking with) can be significant. This use case leads to increased efficiency.

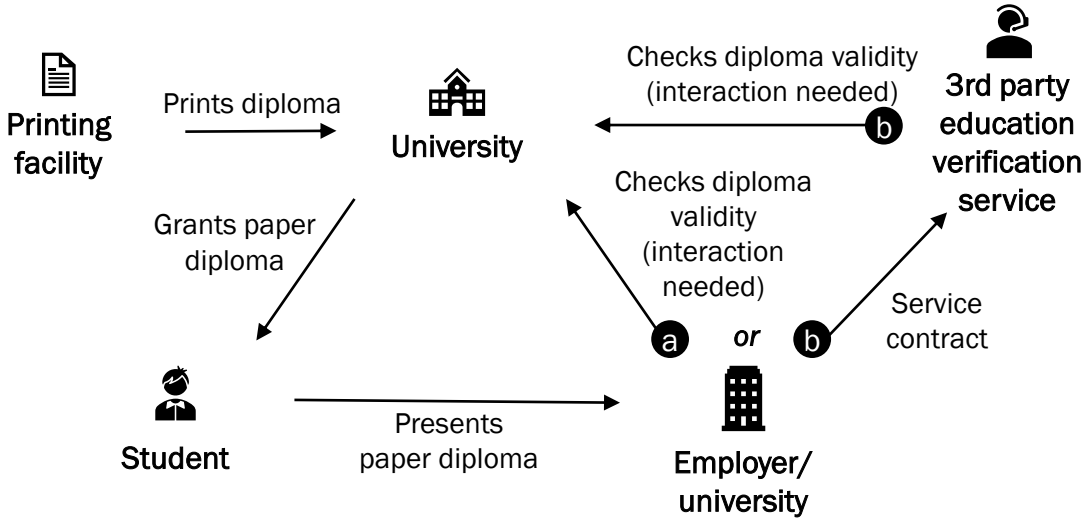
3. ECOSYSTEM & ROLES

PER USE CASE

THE ECOSYSTEM WITH AND WITHOUT THE USE OF SSI

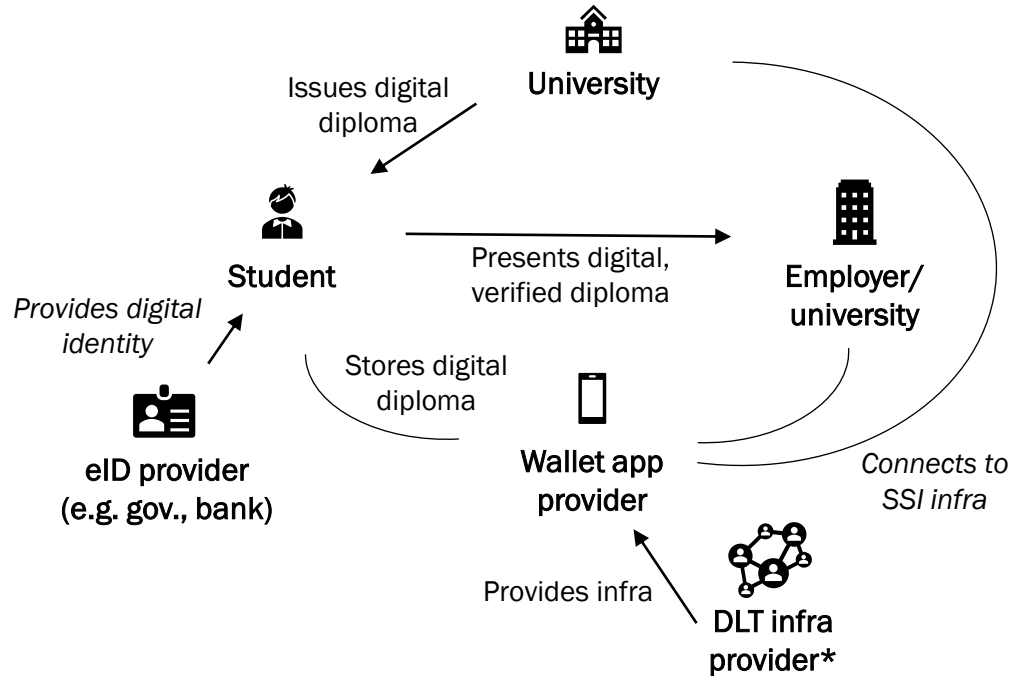
USE CASE 1: DIGITAL DIPLOMA

Current



- Each diploma is printed one time by printing facility
- Student presents scanned or original paper version of diploma to employer, exchange university, etc.
- Employer calls/mails university to check diploma validity (a)
- Employer outsources the validity check task to 3rd parties in some cases (b)

With SSI



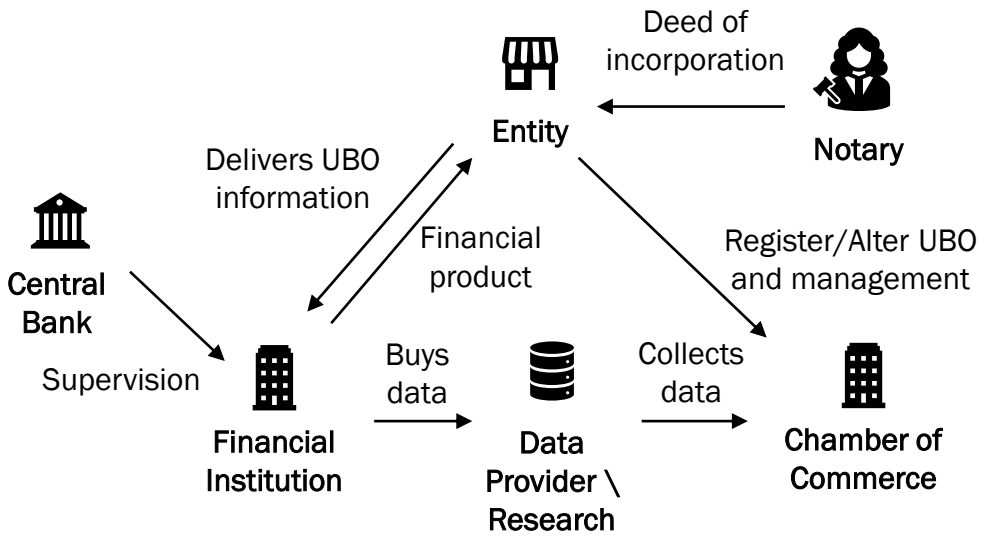
- Verification of identity of all roles precedes this use case (SSI onboarding)
- Employer does not contact university to verify authenticity of diploma
- Diploma gets verified when digitally presented, no interaction needed
- One wallet app provider can serve all three parties, or they can all have a different provider
- DLT infrastructure is provided to all parties to use, service contract usually through wallet app provider

*DLT infra provider role is simplified. We focus mainly on the "upper part" of the ecosystem during this study. The underlying DLT ecosystem will consist of several parties, which is here simplified to "DLT provider".

THE ECOSYSTEM WITH AND WITHOUT THE USE OF SSI

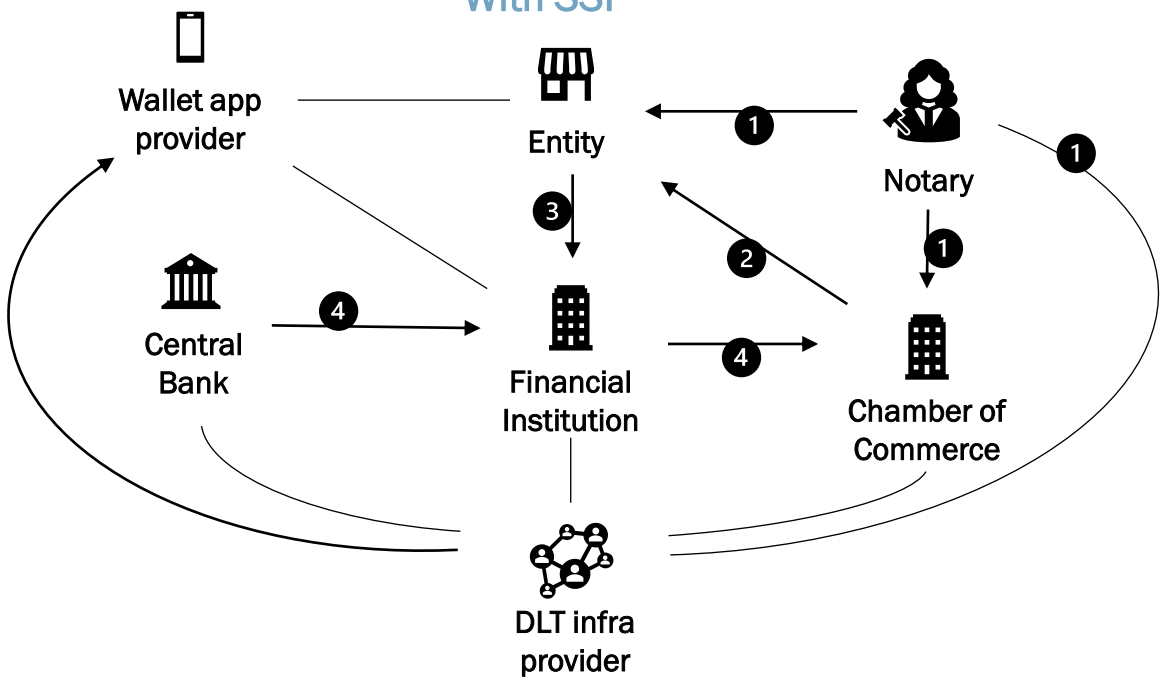
USE CASE 2: UBO (KYC)

Current



- When establishing a business the business has to be registered by a notary act.
- The entity consists of the company. Which is managed by the board on behalf of the owners of the company, the stock holders. Both registered with the CoC.
- The Notary identifies the owners and board of the company and issues the deed of incorporation together with the information about the UBO, a company passport.
- The entity then registers the UBO with the UBO register, governed by the CoC. This is required by law.
- The entity is then able to enter a business relation with a financial institute. Who checks the UBO information. Besides that it is required to do due diligence and check the owners and board members with the sanction lists.
- The data provider / Investigator collects data from public sources and sells the data to the financial institute, so it is able to fulfil it's duty of due diligence.
- The process of how the financial institute fulfils it's due diligence and mitigates it's risk is supervised by the central bank.

With SSI



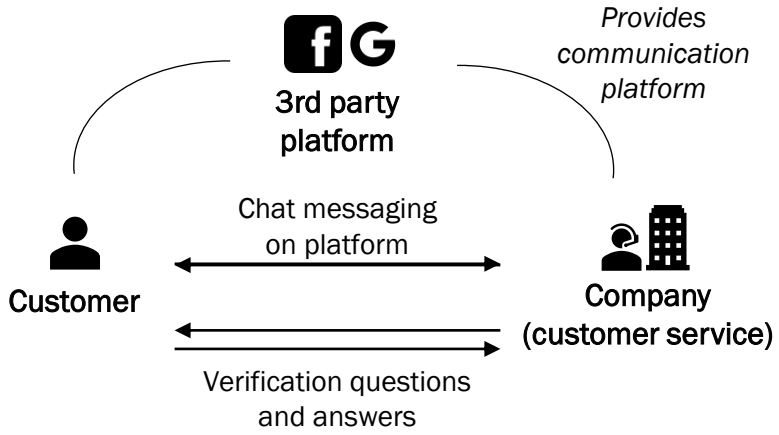
1. Notary(ies) register(s) it's certificate of authenticity with the chamber of commerce. Whereafter the notary is able to issue new and changes to digital company passports and publishes prove of issue on the SSI infrastructure.
2. CoC issues who is the qualified decisionmaker (management) of the entity.
3. With these credentials and information the entity (customer can provide UBO and other relevant information to the financial institution, such as the qualified decisionmaker.
4. Finally the financial institute verifies the presented certificates connected to the issued credentials from the notary(ies) with the CoC. The central bank governs this process.

- 1 – 4 will run through the SSI wallet app provider over the DLT infrastructure
- These sequential steps makes it possible for the financial institutions to use the SSI infrastructure to check that the right assurances are provided with the credentials.
- The data provider role disappears here. Which creates the most benefits.

THE ECOSYSTEM WITH AND WITHOUT THE USE OF SSI

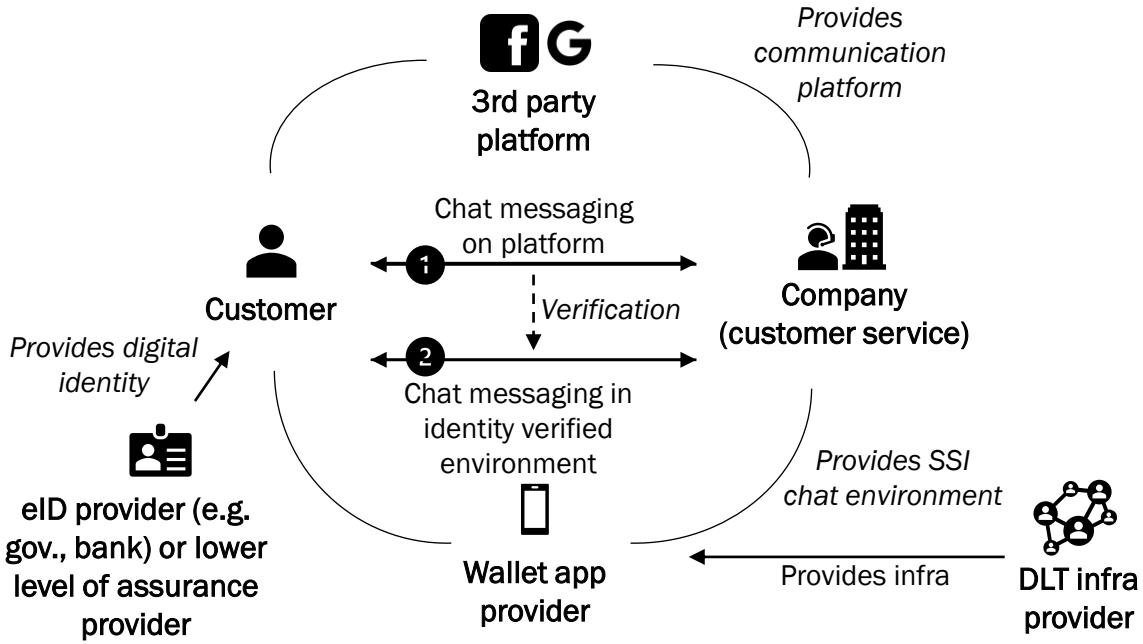
USE CASE 3: TRUSTED COMMUNICATION

Current



- Customer chats with customer service of a company using a 3rd party platform (e.g. Messenger, Google), or propriatary chat of the company, or a phonecall
- To verify identity of customer, company asks personal verification questions before being able to answer customer questions

With SSI



- Verification of identity of customer and company precedes this use case (SSI onboarding), which can be of lower assurance level than eID
- Customer can start chat with customer service on 3rd party platform
- If the question requires identification, a request for identification will be sent to the customer. With scanning the QR-code with the wallet app he/she proofs his/her identity to the company.
- The wallet app provider builds in this functionality (it can be a simple API) for company, or company develops it itself.

COMPARISON OF ECOSYSTEMS WITH AND WITHOUT SSI

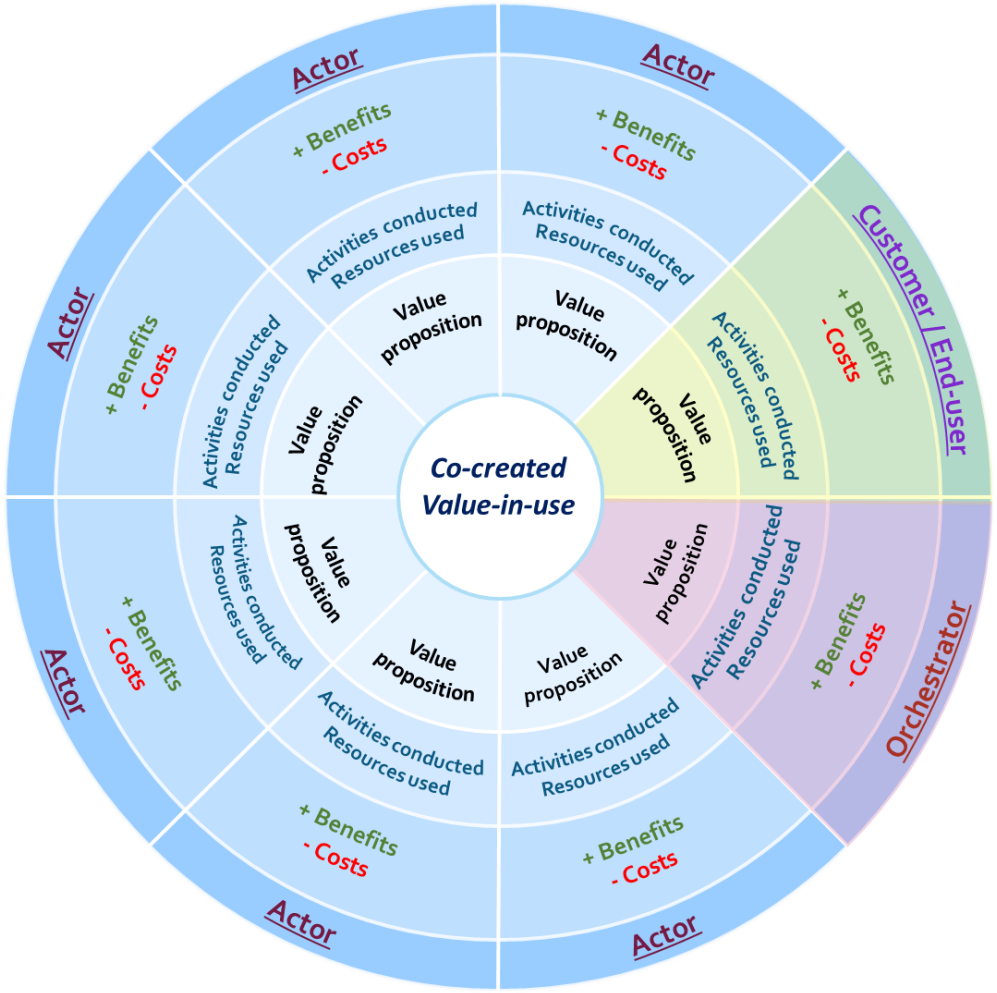
WHAT CHANGES?

	New roles	Disappearing roles	Efficiencies	Investments	Change in governance
 UC1: Digital diplomas	- Wallet provider - DLT infra provider - eID provider	- Printing facility - 3rd party education verification service	- Less administrative burden (validity checks) - Faster checks - Less paper use - Lower risk of fraud	- SSI infrastructure - Onboarding costs - Develop systems - Create VC format of diploma	- Wallet app provider high power; will be the link between DLT infra and all other users
 UC2: KYC business account	- Wallet Provider - DLT infrastructure provider - eID provider (government)	- Data provider / research bureau	- No annual checks - Automated supervision - Less paper work - Less fraud	- SSI infrastructure - On boarding costs	- DNB will still be the center of power; it is the supervisor over the regulatory adherence
 UC3: Trusted communication	- Wallet provider - DLT infra provider - eID provider (or lower level of assurance provider)	none	- Time saving (no validation questions asked) - Lower risk of fraud, higher trust - Better customer experience - Conversation automation possible	- SSI infrastructure - Development of SSI verification API - Onboarding costs (low)	- Less power for 3rd party platforms; less dependency on them and less data access for them

4. BUSINESS MODEL OPTIONS

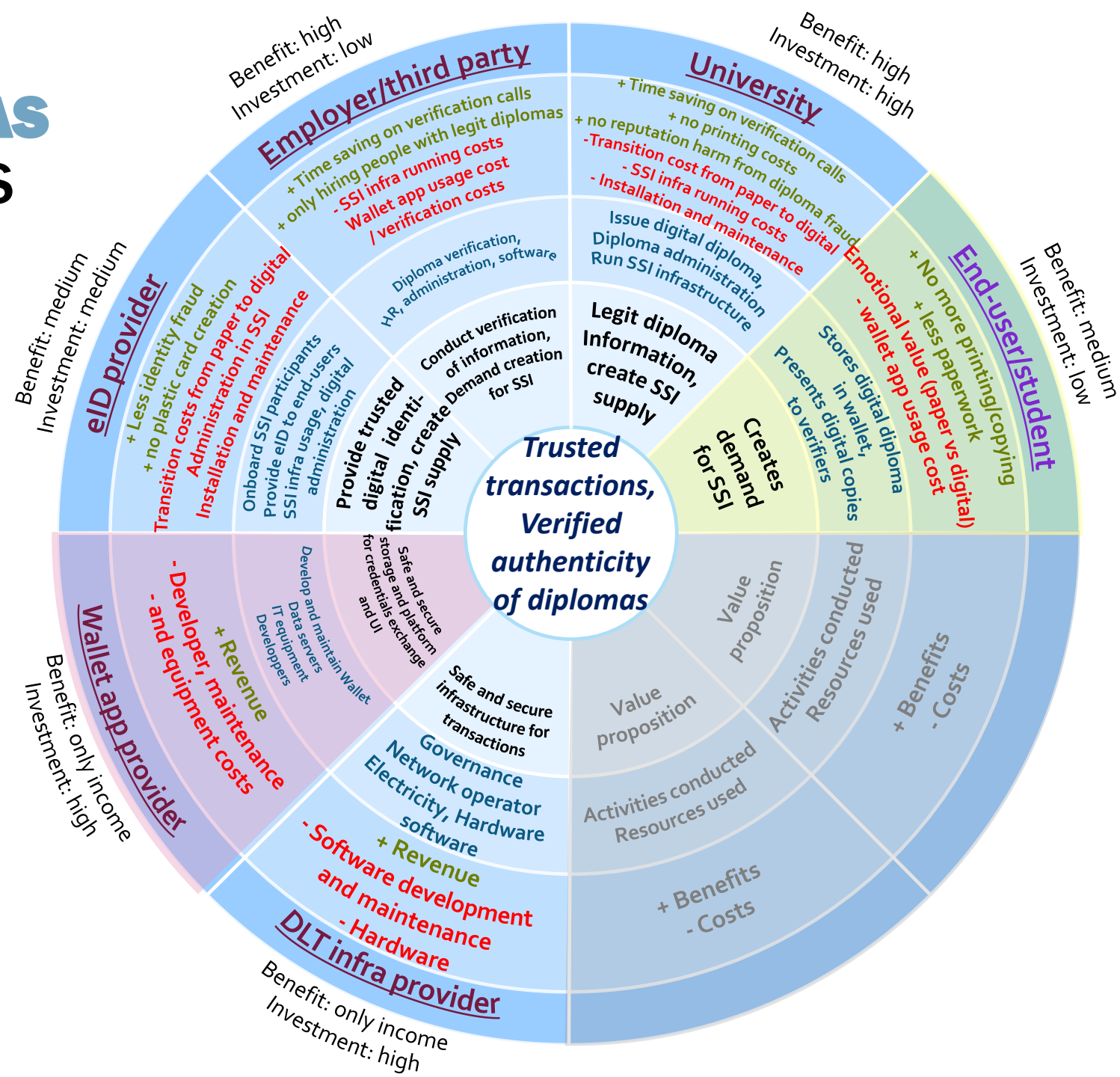
FRAMEWORK INTRODUCTION
SERVICE-DOMINANT BUSINESS MODEL RADAR

- In SSI use cases parties create value together, and processes and collaboration are key. Therefore, a business model canvas was which has a **multi-actor perspective** and a **service-dominant focus** (instead of physical product focus) was chosen.
- In the circle in the middle represents the main value that is created by all the actors in the ecosystem collaboratively. Each actor contributes to this value in different ways.
- Each "slice" represents a different key actor in the ecosystem that contributes to the value creation. Per actor the main benefits, costs, activities, resources and their value proposition are described in brief.
  - Actor (blue); a core partner, contributes actively to the essentials of the solution.
  - Focal organisation (red); often the party that initiates the setup of the business model and participates actively in the solution.
  - Customer (green); main end-user of the cocreated value



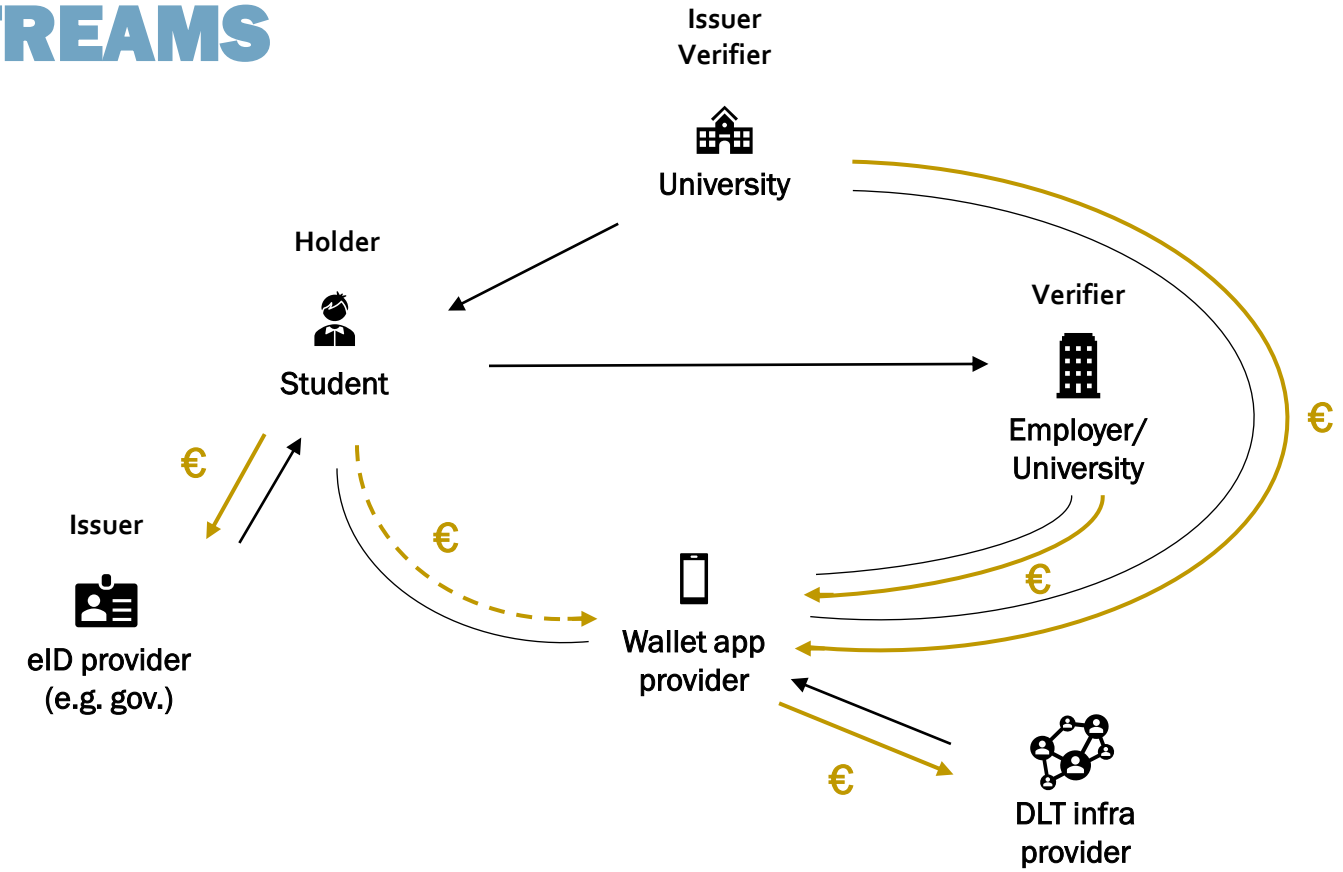
Source of model: Service-Dominant Business Model Design for Digital Innovation in Smart Mobility, Turetken, O., Grefen, P., Gilsing, R. et al. Bus Inf Syst Eng 61, 9–29 (2019). https://doi.org/10.1007/s12599-018-0565-x

1 DIGITAL DIPLOMAS BUSINESS MODEL



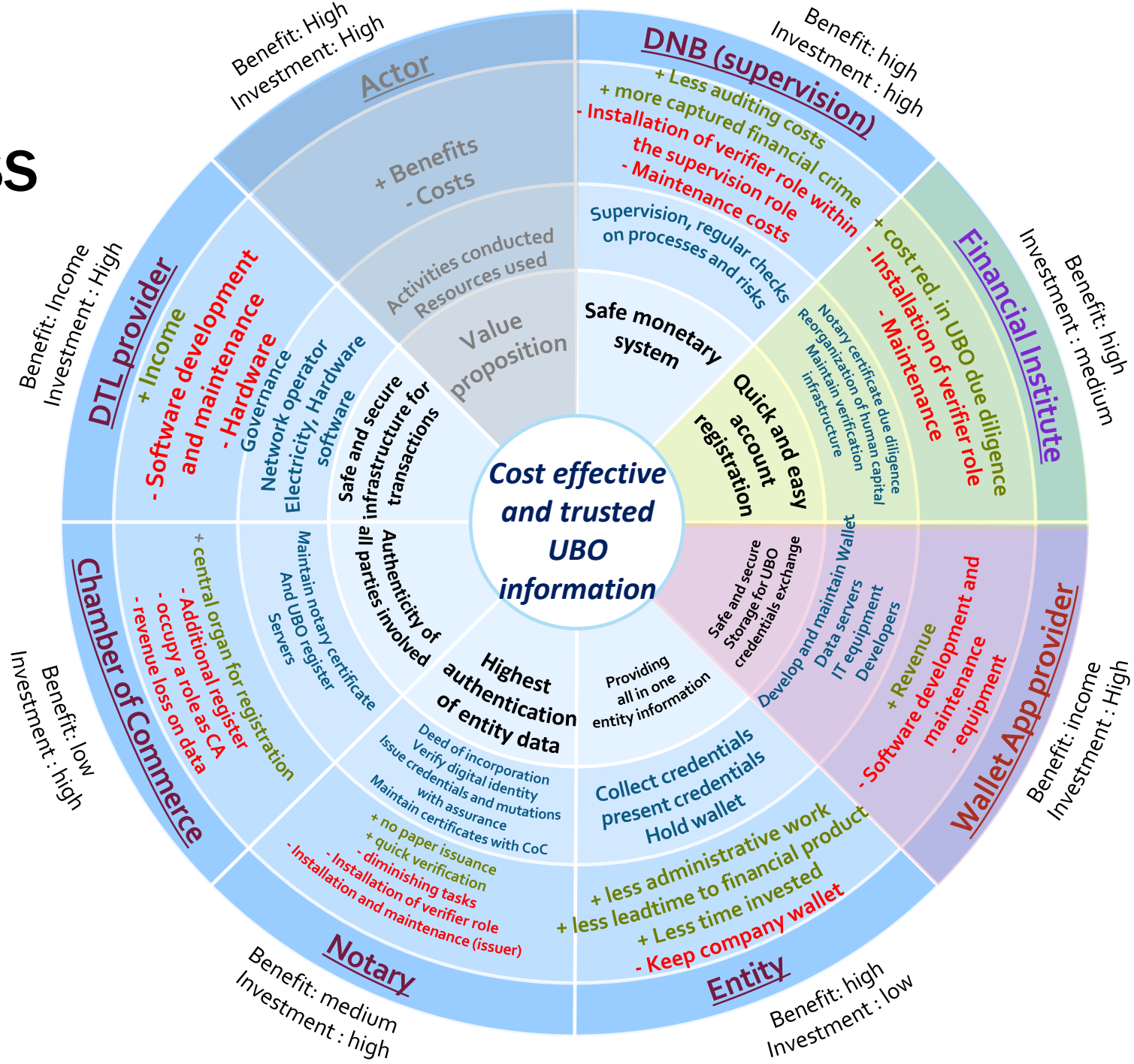
Incentive to participate per role			
Role	Benefit	Investment	Governance
End user / Student	medium	low	medium
University	high	high	high
Employer / Third party	high	low	high
eID provider	medium	medium	low
Wallet app provider	income	high	medium
DLT Infra provider	income	high	low

REVENUE STREAMS



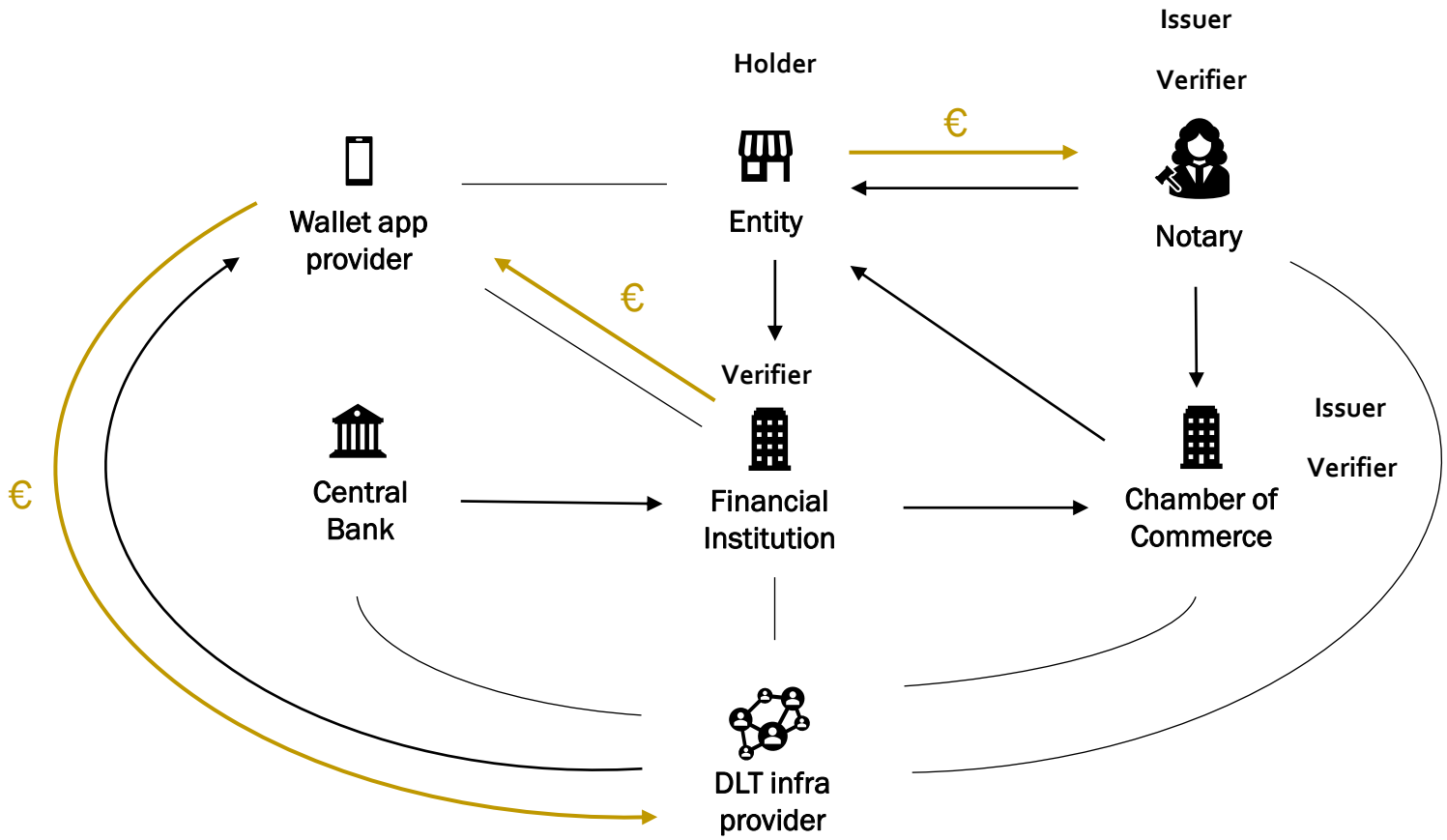
	Issuer (university)	Holder (student)	Verifier (employer)	Wallet app	DLT prov
Services (VC issuance)	revenue/no	pays/free	-	-	-
SSI usage	pays	pays/free	pays	revenue	-
DLT infra usage	-	-	-	pays	revenue
Investment	high	low	low	high	high

2 UBO BUSINESS MODEL



Incentive to participate per role			
Role	Benefit	Investment	Governance
Entity	high	low	medium
Wallet app provider	income	high	medium
Financial Insitutions	high	medium	high
Notary	medium	high	low
DNB	high	high	high
DLT provider	income	high	high
CoC	low	high	low

REVENUE STREAMS

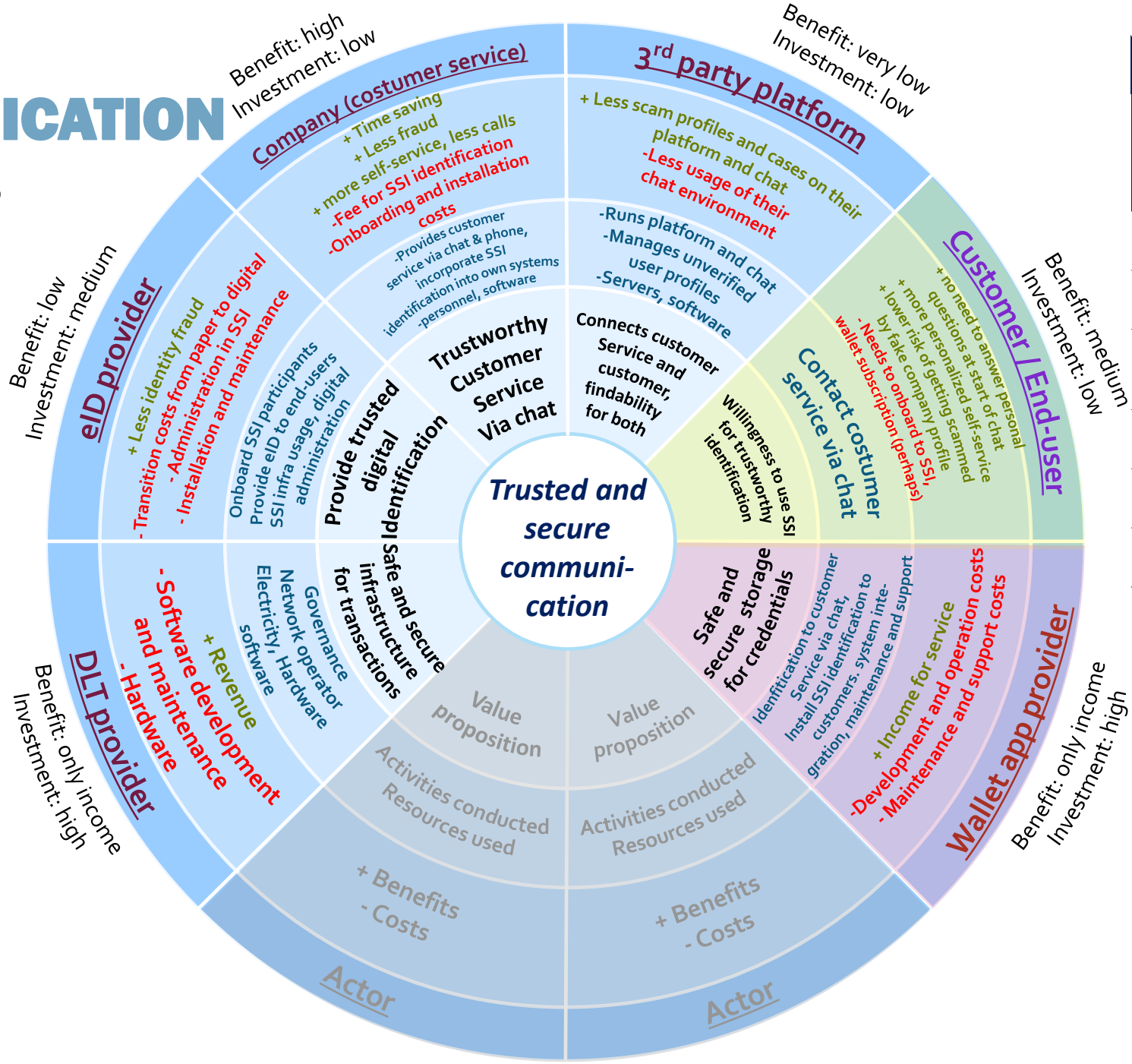


	Issuer	Holder	Verifier	Wallet app	DLT provider	CoC
Services (VC issuance)	Revenue (Notary)	pays	-	-	-	
SSI usage	-	-	Pays (Financial Insitution)	revenue	-	-
DLT infra usage	-	-	-	pays	Revenue	-
Investment	high	low	high	high	high	high

2 COSTS AND BENEFITS ON ECOSYSTEM LEVEL

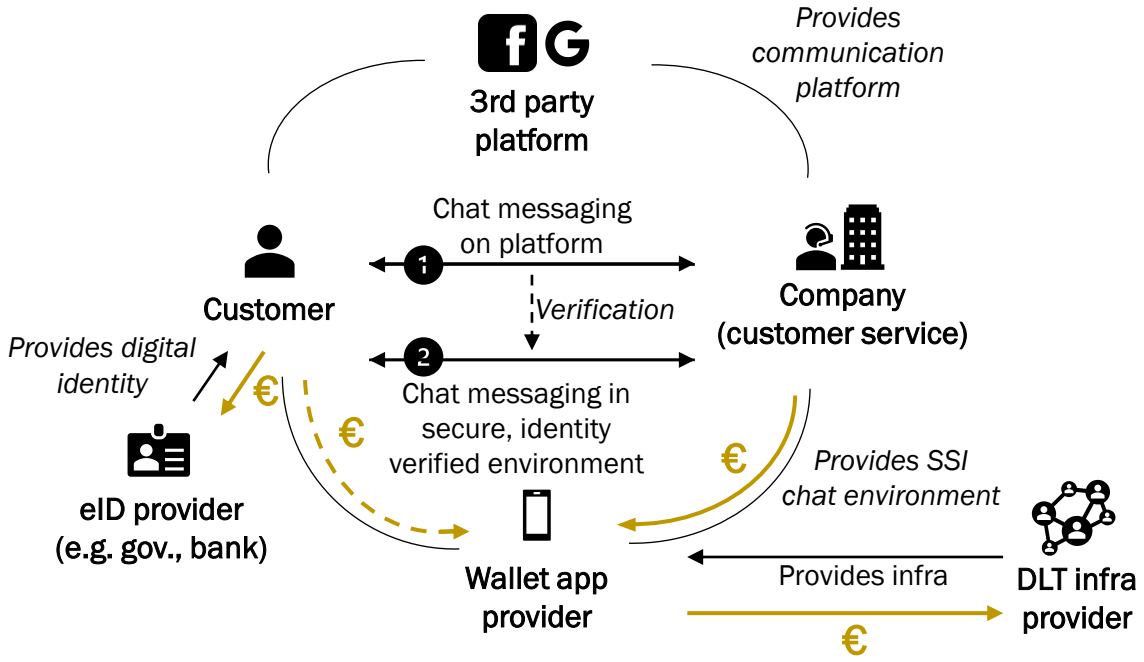
- The financial institute and the ecosystem around the UBO information benefit from the usage of SSI. The information provided by the entity to a financial institute does no longer need additional due diligence, making it quicker and less cost ineffective. Currently the information about the UBO is stored within the UBO register, required by law. However, financial institutions investigating the truth of the information may not solely rely on this register. This is one of the reasons this process is very costly especially when it must be performed annually to monitor changes in the information. The payment made to request the relevant data from the data providers averages to €500K per financial institute, excluding personnel costs and other investigation bureaus. By making use of SSI a financial institution's due diligence is no longer needed and reduces their costs and be able to shift their work force towards more complex due diligence. Also, because there is less risk due to a systemic change, everyone involved will experience less fraud. Holders of information will have less work and lower lead time for their financial product. In conclusion there will be less costs for paperwork, collecting information and resolving fraud.
- On the other hand, due to the systemic change existing roles like the one of the data provider may disappear and new roles will emerge. The role of the data providers and investigators will disappear. The wallet app provider and the DLT provider must emerge. New entries in the system take along a shift in money streams. DLT providers will be paid by the wallet app provider. The wallet app provider will be paid by the financial institute verifying the credentials. Instead of paying the old data providers and investigators the money will shift to the facilitation of reliable UBO information. Although it shifts the money spent will be less. The issuers however will compared to the verifiers experience lesser cost reductions. This will be only in the form of less paper work. This reduction will be minimal during the early stages of SSI where the physical issuance will still coexist with the digital one. Since different entities will have their information in different forms, either as a holder in a wallet or as physical administration. For both the verifier and especially the issuer this will be a huge barrier. Because for these parties it does not make a difference of changing to a new system when the costs are equal or even higher. However, the usage of SSI might provide a competitive advantage for notaries who move first.

TRUSTED COMMUNICATION BUSINESS MODEL



Incentive to participate per role			
Role	Benefit	Investment	Governance
Customer/ end user	medium	low	medium
3rd party platform	very low	low	low
Company (customer service)	high	low	high
eID provider	low	medium	low
DLT provider	income	high	low
Wallet app provider	income	high	high

REVENUE STREAMS



	Issuer	Holder	Verifier	Wallet app provider	DLT prov
Services (VC issuance)	revenue	pays	-	-	-
SSI usage	pays	pays/free	pays	revenue	-
DLT infra usage	-	-	-	pays	revenue
Investment	medium	low	low	high	high

COMPARISON OF USE CASES

SIMILARITIES

- **Revenue models** look similar for each case; fulfilling certain roles in an ecosystem will
- Wallet app provider has a very **central role** in each case, they connect all other parties, almost all financial streams flow towards or through them
- **eID provider is involved in the first step** of each use case, and therefore needs to be one of the founding parties
- **Business models are not crystalized yet**, there are different options possible and no standard has emerged

DIFFERENCES

- **Power of wallet app provider** differs per case (very high in KYC, lower in diploma case)
- **Different levels of assurance** are needed as a starting point (for UBO it's high, for trusted communication it can be low, e.g. a customer number)
- **The extend to which current processes need to change** differs largely, some are much easier to implement than others



5. BARRIERS TO ADOPTION & SOLUTIONS

IN GENERAL AND PER USE CASE

1 DIPLOMA USE CASE (1/2)

BARRIERS AND SOLUTIONS

Student

1. **Emotional value** of printed diploma is high for students currently, this could hamper adoption.
2. **Student** participation could become bottle-neck; they **experience the least benefits** from this change, as they have to prove the validity of their diploma very rarely.

1. It can be expected that the digital diploma will be introduced as an **add-on** to the physical one, which will mitigate this barrier. Besides, the **new generation** will not feel connected with paper anymore, as they grew up in a connected world, and will accept a digital version easily, and probably even drive adoption.
2. It should be made **easy and low cost for the student to start** this use case. Also, involvement in a **combination of other SSI use cases** could be encouraged, as it could increase the experienced benefit for them, making adoption more likely.

University

1. Transition for universities is a bottle-neck, it requires a **significant procedural change** from their side.
2. There will be a phase where the **physical and digital** diploma need to co-exist, leading to additional costs.
3. **Price model to the wallet app** will have an impact on adoption.

1. Making SSI system **integration as easy as possible**, proving benefits with a clear business case, and sharing learnings and/or best practises from pilots/early adopters. They might need a “push” to get started.
2. It can be expected that the digital diploma will be introduced as an add-on to the physical one, leading to an additional process and cost. However, **savings would already be significant** even in this “two diplomas” scenario.
3. Employers and universities need to be able to **pay per diploma they check instead of monthly fee**, to keep it fair (risk needs to be carried by wallet app, not issuer/holder)

1 DIPLOMA USE CASE (2/2)

BARRIERS AND SOLUTIONS

	BARRIERS	SOLUTIONS
Employer/ University (verifier)	1. Verifiers will experience high benefits, but they will need to **change their processes** significantly, potentially leading to changes in personnel structure. 2. **Interoperability will be difficult** to achieve; in the end all verifiers need to use all types of VCs.	1. The change from verification calls to instant verification will **save lots of time** which can be spent on other tasks. A clear plan and communication about this can take away the barrier. Most probably, this will be incorporated in Common off the Shelf (COTS) HR programs. **Only the early adopters will have to invest in integration.** 2. A solution could be **building in a gateway** or the use of a credential catalogue. An EU standard on type of credential would also be beneficial, and parties like SURF and DUO could play a role in this trajectory.
Wallet app provider	1. Wallet app provider is **less powerful** in this use case. Student choses university based on program and not based on wallet app ecosystem reach, leading to smaller likelihood of lock-in (beneficial for wallet app provider). 2. Their **price model** will be determining adoption.	1. There is **still a significant market** and it will be a good business opportunity for the one taking on this role, with freedom to shape the business model. It is also one of the use cases with the most visibility, as it is **promoted by the EU** in pilots. 2. This means less flexibility, however, they have the **first-mover advantage in a new market**.
General	1. Lots **of harmonization will be needed throughout Europe and beyond**, each country has a very different educational system and regulation. 2. **Education verifiers role will disappear** or change; this could slow down the process, they could be against this change.	1. **Expanding by federation** instead of “first harmonize, then scale” approach could help. 2. **Involve them from the beginning** onwards and find an adjusted role for them which will create value in the new circumstances.

2 UBO (1/2)

BARRIERS AND SOLUTIONS

	BARRIERS	SOLUTIONS
Owner / director	1. Drives adoption and **its interest are of importance**. Neglecting its needs could create a barrier.	1. When the facilities are ready to serve organizations to provide UBO information using SSI, **this player will be more than happy to adopt.**
Financial Institution	1. Proof of correct verification of credentials of owner/director towards the Central Bank, supervisor. 2. **The financial institute will be a huge adoption driver**.	1. The central bank should adopt also the SSI system and by doing so execute checks through SSI. This will be a faster and a bigger sample, decreasing fraud again. 2. The financial institutes can easily be used as adoption driver, since **they benefits most from this use case** and potential use cases that could build on top of it.
Wallet app provider	1. Different notaries and banks will use a **different semantics and syntax** for their credentials. This could hamper adoption, because of the many differences.	1. Implementing the **usage of the credential catalogue and a translator between wallet apps** and issuers and verifiers could focus the USP to the user interface and ease of use. 2. **Assurance communities** of financial institutes and regulators will play a crucial role in deciding on the syntax, semantics, and level of assurance. They also control who will be a wallet app provider.

2 UBO (2/2)

BARRIERS AND SOLUTIONS

	BARRIERS	SOLUTIONS
 Notary	1. Verification of documents and their authenticity is no longer necessary. Their hours decrease and their revenue. This **demotivates them to innovate** towards efficient solutions. 2. From origin notaries are not technology oriented. However, they **require a technical shift,** they require help to adopt in this manner.	1. By giving them an extra role that could compensate the loss in revenue they will be more motivated. **Their independent role between parties and as the central entity of trust; they can strengthen this with SSI.** 2. Notaries will **need support** of the central organizations to move towards SSI.
 Chamber of Commerce	1. For the chamber of commerce **nothing changes**. Only the form in which they work which will be through SSI. Which means a lot of investment in their new way of working.	1. Due to its central role and it being a public organization **it could help controlling the ecosystem.** Thereby taking part in the assurance community.
 Central Bank	1. The central bank takes the **role of supervision**. Due to a transitional phase this **will become very complex.** Some organizations will handle their UBO using SSI others not. UBO information will be intertwined resulting in a process handling both types of information.	1. Should in consultation of the financial institutes implement SSI and **create a fast and waterproof way of verifying the UBO information**. They will no longer have to use a sampling method Especially where there is still information using non-SSI processes.
General	1. Parallel phase of physical and digital information; consideration of the transitional business case is important.	1. This use case will experience a **long transitional phase** going from physical to digital information. **Players that experience more benefits could possibly help players with higher costs to make the transition**. Such that the whole ecosystems adapts faster.

3 TRUSTED COMMUNICATION (1/2)

BARRIERS AND SOLUTIONS

	Barriers	Solutions
 Customer	1. Customers likely won't adopt SSI specially for this use case, as **they don't experience the benefit often enough.**	1. It should be easily adoptable for customers, based on credentials already in the app. They need to have a wallet with at least a minimal sufficient identity certificate in it, which they are more likely to create if they can use it for other use cases as well. A **bundled effort from companies is needed**, so customers will recognize this new process at many insitutions.
 Wallet app provider	1. End user **will most probably not pay** for this solution.	1. Wallet app provider needs a business model incorporating this to ensure wide adoption, **focussing on revenue from the customer service company side**.
 Company (customer service)	1. In the efficiency-driven world of customer service, this **change needs to be incorporated easily** and with as little training as possible. 2. Almost all **costs will fall onto customer service** company. (Could also be a customer service portal provider, who is likely to be the first adopter.)	1. Customer service **needs good onboarding**. The change in current processes need to be minimalized, so that customer service personnel can easily incorporate this change. Based on current maturity, the **change can be made minimal**. 2. The **user experience for the company should be optimized** to ensure that the only cost they have is the price they pay to the wallet app provider (which can be a one time fee/subscription or pay per transaction.)

3 TRUSTED COMMUNICATION (2/2)

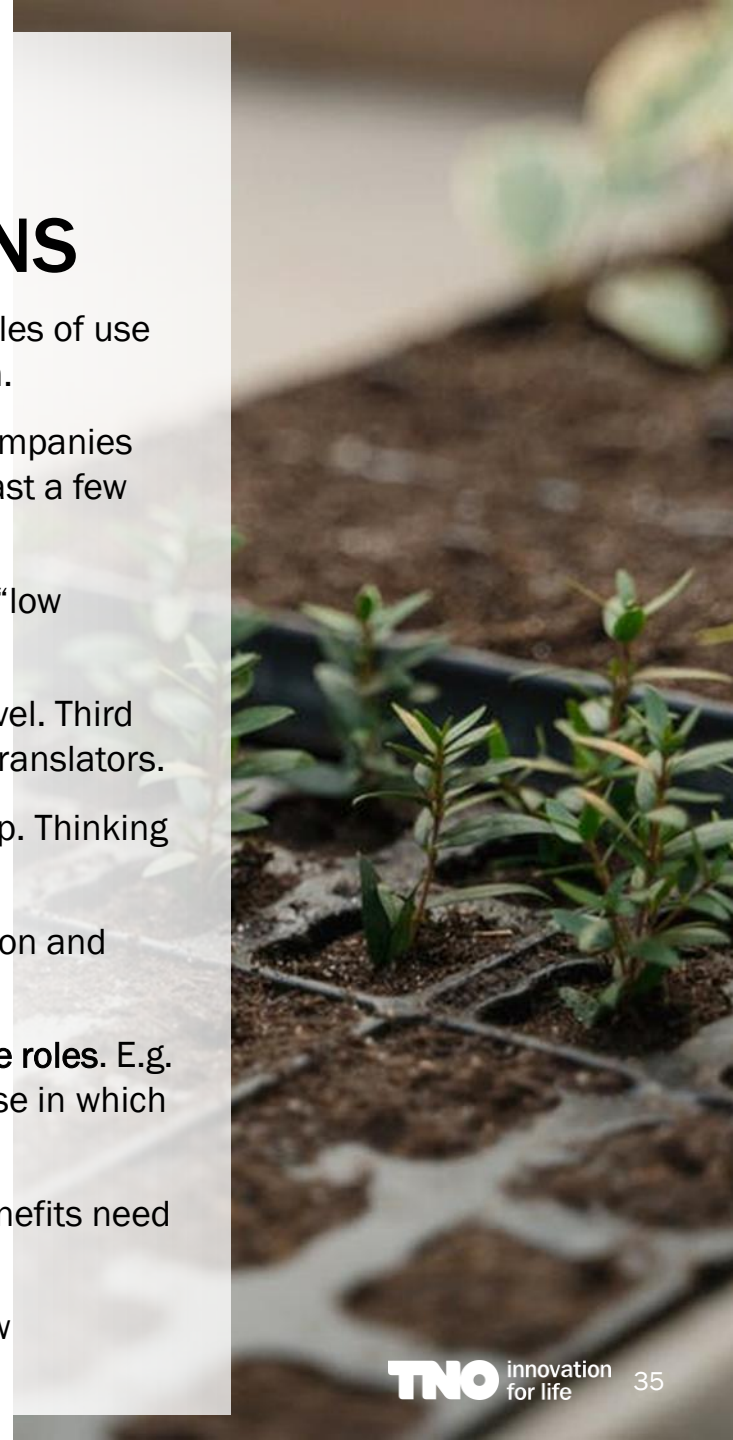
BARRIERS AND SOLUTIONS

eID provider (e.g. gov., bank)	1. eID provider **has no strong incentives to participate** in this case.	1. **Other cases** with more benefits for this party will be **needed to ensure their participation**.
3rd party platform	1. 3rd party platform **incentives remain somewhat unclear.** Their position will likely not change, as they are still the platform on which the other parties connect. **Not expected that they will hamper implementation**, but because of their strong power position they could potentially have an effect on it.	1. Not expected that they will hamper implementation, but **because of their strong power position they could potentially have an effect on it.**
General	1. **Adoption might be easier** than for the other use cases, as this one is **more similar to the status quo instead of a drastic change in processes.** It is basically an additional service by a new provider to add on to existing processes. This can help adoption.	

GENERAL

BARRIERS TO ADOPTION & SOLUTION DIRECTIONS

1. **Transition and scaling phase will be challenging** for many parties within the ecosystem. Creating bundles of use cases that bring frequent value to end customers can drive the demand side, which will help adoption.
2. **“Parallel phase” will come after adoption** - when paper and digital streams will coexist. This means companies will need to keep two different processes functioning. Implementation of SSI will need to lead to at least a few quick benefits to create enough push for adoption.
3. **Main value will come when scale is reached**; finding starting parties will be difficult. Starting with the “low hanging fruit” cases – easy to implement and quick value - will create the starting base of adopters.
4. **Interoperability** and supporting different semantics by all wallets needs to be achieved on a system level. Third party SSI service providers can play a role in this, who can offer interoperability layers, gateways and translators.
5. **Harmonization will be needed throughout Europe** to unlock even more value, but this is a complex step. Thinking already at the start about this and making early agreements can help.
6. **Wallet app provider position is very powerful**. Could hamper open ecosystem, create lock-ins. Regulation and pushing for interoperability can mitigate this risk.
7. Imbalances for a party in costs/benefits can be **balanced out by participating in more use cases/more roles**. E.g. if one party is an issuer with low benefits in one use case, this party can join an additional SSI use case in which it has high benefits to make the investment for SSI participation justified and viable.
8. **No clear business cases** per party yet; how much do they actually save? This hinders adoption, the benefits need to be clear and calculated.
9. There will also be a **change in collaboration between parties and (internal) processes**. This means new agreements need to be made, this takes time and needs to get sufficient attention.



6. CONCLUSIONS REGARDING ADOPTION

ADOPTION WILL TAKE PLACE AT A DIFFERENT PACE FOR EACH USE CASE BASED ON BENEFITS AND INVESTMENTS

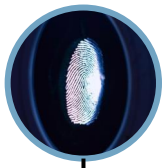
- Some use cases are ready for implementation, for others more alignment between the parties and business model innovation is needed to go towards implementation. It makes sense to start with the simpler UCs and work towards the more complex ones. However, other factors can influence the speed of adoption positively as well (e.g. financials expect high rewards and have the power to push their users to adopt, diploma use case is backed by the EU).

1. Start with implementation of trusted communication use case

- Low complexity, relatively low investment needed, medium benefit for each participating party
- This use case can drive early adoption

2. Start organizing the diploma use case

- Requires bigger changes on verifier and issuer side, scaling will be challenging
- This use case can be introduced when end users are starting to use SSI for other UCs as well



3. Start discussions around the UBO use case

- High complexity and significant changes to the current way of working in several parties, but also high rewards
- New ways of working, collaborations need to be given shape

timeline

Final word of advise:

- **Start business modelling together with the main stakeholders in your ecosystem**, discuss together how the new situation should look like, which changes you want to make and how you will work on the aforementioned challenges.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