



Network for Studies on Pensions, Aging and Retirement

Towards integrated personal financial planning

Information barriers and design propositions

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DESIGN PAPER 117

NETSPAR INDUSTRY SERIES

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Netspar Design Paper 117, March 2019

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Abstract

According to a recent study, almost half of all Dutch adults are worried about their financial future. When trying to create an overall picture of their financial situation, individuals face a fragmented information landscape consisting of both public and private organizations that each hold a piece of the puzzle.

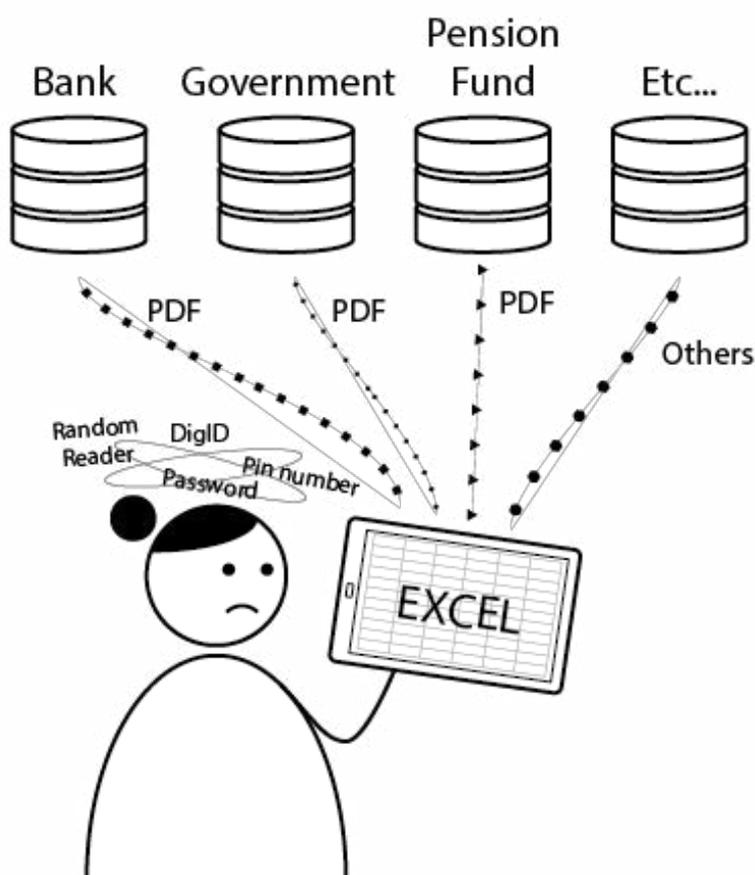
The objective of this paper is to study the information barriers that individuals face and to formulate design propositions that can empower them to access, use, and share data for financial planning (oversight, insight, and recommendations) more easily.

Drawing on the design science research approach, we have identified a broad set of *information barriers* that individuals face when seeking to collect or use personal data or to share such data with providers of financial planning services. Barriers include not knowing where to start, lack of a single information source, the need to remember multiple digital identities, time consuming data search (paper and digital), manual data entry processes in portals and apps, the need for paper signatures, different data definitions, and lack of control over how the data are used.

The overall design proposition is that removal of the barriers identified requires collective action across the various financial domains (i.e. pensions, mortgages, banking, insurance, and public services). Such collective action needs to develop and govern a cross-domain infrastructure for information exchange, for both financial planning and tailored service delivery. This paper identifies the following solution components (or building blocks) for such a cross-domain infrastructure: (1) personal data spaces for secure personal data management, (2) easy-to-use, high-level assurance electronic IDs linked to the personal data spaces and enabling qualified electronic signatures, (3) data specifications (standardization of syntax, semantics, and structure) allowing for automated data processing, (4) remotely accessible tooling/ functionalities for data aggregation, analysis, and self-service planning or via specialized financial planning tools, (5) compliant interaction processes for automation of information collection, exchange, processing, and service delivery, (6) secure technical interfaces (APIs) for information sharing (posting and retrieving data, including consent) that can be used by all actors across multiple financial domains, (7) support for organizations that wish to use the above components, and (8) a cross-domain public-private governance that steers the development and adoption of the various solution components.

How to proceed? This paper introduces three scenarios for developing a cross-domain infrastructure: (I) a coalition of companies takes the lead, (II) the public sector takes the lead, or (III) public-private collaboration flanked by academics (research questions, theories, and methodologies facilitate the configuration and design of the cross-domain infrastructure and its governance).

Future research can focus on developing, implementing, evaluating, and improving these components in a living lab or pilot setting that includes financial service providers, data providers, individuals/households, and financial planning tool providers.



Samenvatting

Bijna de helft van alle Nederlanders is bezorgd over de eigen financiële toekomst. In de zoektocht naar financieel inzicht, overzicht en handelingsperspectief worden velen geconfronteerd met een gefragmenteerd gegevenslandschap dat op verschillende publieke en private partijen leunt die elk in het bezit zijn van een stukje van de financiële puzzel.

Het doel van deze paper is om de informatiegerelateerde barrières voor persoonlijke financiële planning (inzicht, overzicht en handelingsperspectief) in kaart te brengen en ontwerprichtlijnen te introduceren die bij toepassing ervan mensen beter in staat stellen om op eenvoudige en veilige wijze gegevens op te halen en te delen ten behoeve van de eigen financiële planning.

Op basis van de 'design science' onderzoeksmethode hebben we een spectrum van barrières geïdentificeerd voor het verzamelen en gebruiken (zelf financieel plannen) van persoonlijke gegevens of die te delen met dienstverleners. De barrières voor burgers/klanten zijn met name het niet weten waar te beginnen, meerdere informatiebronnen (meestal achter mijn-portalen), het moeten beheren van meerdere digitale identiteiten (voor toegang via mijn-portalen), de tijdrovende zoektocht naar gegevens (papier en digitaal), het handmatig gegevens overtypen in verschillende portalen (of apps), de noodzaak van handtekeningen op papier, verschillende gegevensdefinities en het gebrek aan regie over gegevens en de verwerking daarvan.

Het wegnemen van de barrières vereist domeinoverstijgende samenwerking waarbij partijen gezamenlijk een open en vertrouwde infrastructuur neerzetten voor informatie-uitwisseling. Deze paper identificeert de volgende componenten voor een domeinoverstijgende infrastructuur: (1) persoonlijke datakluisen voor regie op gegevens, (2) eenvoudig te gebruiken digitale identiteiten met het hoogste zekerheidsniveau, waarmee ook gekwalificeerde elektronische handtekeningen geplaatst kunnen worden, (3) dataspecificaties (standaardisatie van syntax, semantiek en structuur) als katalysator voor de geautomatiseerde verwerking van gegevens, (4) online functionaliteiten/services die door burgers kunnen worden gebruikt voor het samenvoegen van gegevens, analyse en financiële planning, (5) gestandaardiseerde processen voor het geautomatiseerd verzamelen, uitwisselen en verwerken van gegevens voor persoonlijke financiële planning en dienstverlening, (6) beveiligde technische interfaces (API's) voor informatie-uitwisseling die door alle organisaties kunnen worden gebruikt, (7) ondersteuning voor organisaties die gebruik willen maken van

de eerder genoemde componenten en (8) een domeinoverstijgende publiek-private governance die stuurt op het ontwikkelen en toepassen van componenten.

Hoe nu verder? Deze paper introduceert drie voortbrengingsscenario's voor een domeinoverstijgende infrastructuur: (I) bedrijven gaan samenwerken en ontwikkelen, (II) de overheid gaat voorschrijven en ontwikkelen of (III) publiek-private samenwerking geflankeerd door wetenschappers (onderzoeksvragen, theorieën en methodieken faciliteren de specificatie en realisatie van de domeinoverstijgende infrastructuur en de governance hiervan).

Dit onderzoek eindigt met een stip op de horizon, richtlijnen, componenten en voortbrengingsscenario's. Kansen voor vervolgonderzoek liggen onder meer in de ontwikkeling, uitvoering, evaluatie en verbetering van de bouwstenen in een living lab of pilotomgeving met financiële dienstverleners, datahouders, burgers en aanbieders van financiële hulpmiddelen.

1. Introduction

1.1 Relevance

This research looks into the information barriers for personal financial planning. According to a recent study almost half of all Dutch adults are worried about their personal financial future (Van der Schors & Verberk, 2018). There is good reason for concern. A study into pension coverage adequacy in the Netherlands found that 33% of all adults run the risk of having lower net pension income than they indicate needing after retirement (AFM, 2015). Policy shifts may confront individuals with greater responsibility for planning their personal retirement. The responsibility for ensuring an adequate standard of living has partly been shifted to the individual person. Individuals have to make their own decisions on, for example, supplementary pension savings or on how to invest their defined contribution pension assets.

This finding underlines the fact that individuals often need to do more than strictly rely on state and collective employer-based pensions (first and second pillar) to achieve adequate pension income. To prevent painful discoveries regarding their pension and other future income, it is important for individuals and households to have information about their complete financial position. However, the fact is that 40% of the Dutch population find it difficult to keep track of their financial administration (Schonewille, Van der Schors, & Kunkel, 2018). This lack of financial insight and oversight can reinforce concerns regarding the financial future. Moreover, insight and oversight are preconditions for recommendations on how to act: what can be done now to ensure adequate income upon retirement?

Personal financial planning can be a solution for many individuals and households. This assumption leans on previous studies that argue that well-informed active planning provides significant advantages in terms of pension preparedness (Van Rooij, Lusardi, & Alessie, 2011). Neukam and Hershey (2003) demonstrated that financial goals have significant impact on retirement savings contributions. Stawski et al. (2007) found that goal clarity serves as an important psychological mechanism, which motivates individuals to plan for the future. Specifically, goals help individuals to structure their perceptions and to form expectations about their future resource needs, thus helping to increase both actual savings levels and the intention to save. Moreover, households who did not engage in planning activities were significantly less likely to accumulate wealth (Van Rooij et al., 2011).

Personal financial planning is the process whereby individuals/households consider their current personal and financial information, determine future financial goals, and develop a financial plan to meet these goals (Dawes, 1998). Basically,

personal financial planning should result in insight (what is my financial position?), oversight (will it be enough?), and recommendations for action (what do I need to do in financial terms?). Individuals can do this by themselves (self-service personal financial planning) or with a certified financial planner (certified or other). This means that individuals/households have access to a total view of their current financial situation as well as to tools and functionalities for scenario-based planning (self-service or via a human financial planner¹). This involves more than just sending information on pensions to households to increase general understanding. It is all about empowerment of individuals to obtain their data from various sources, to work with these data, or to transfer them to specialized service providers. Such capabilities should provide a better basis for personal financial planning, with or without digital and other advice.

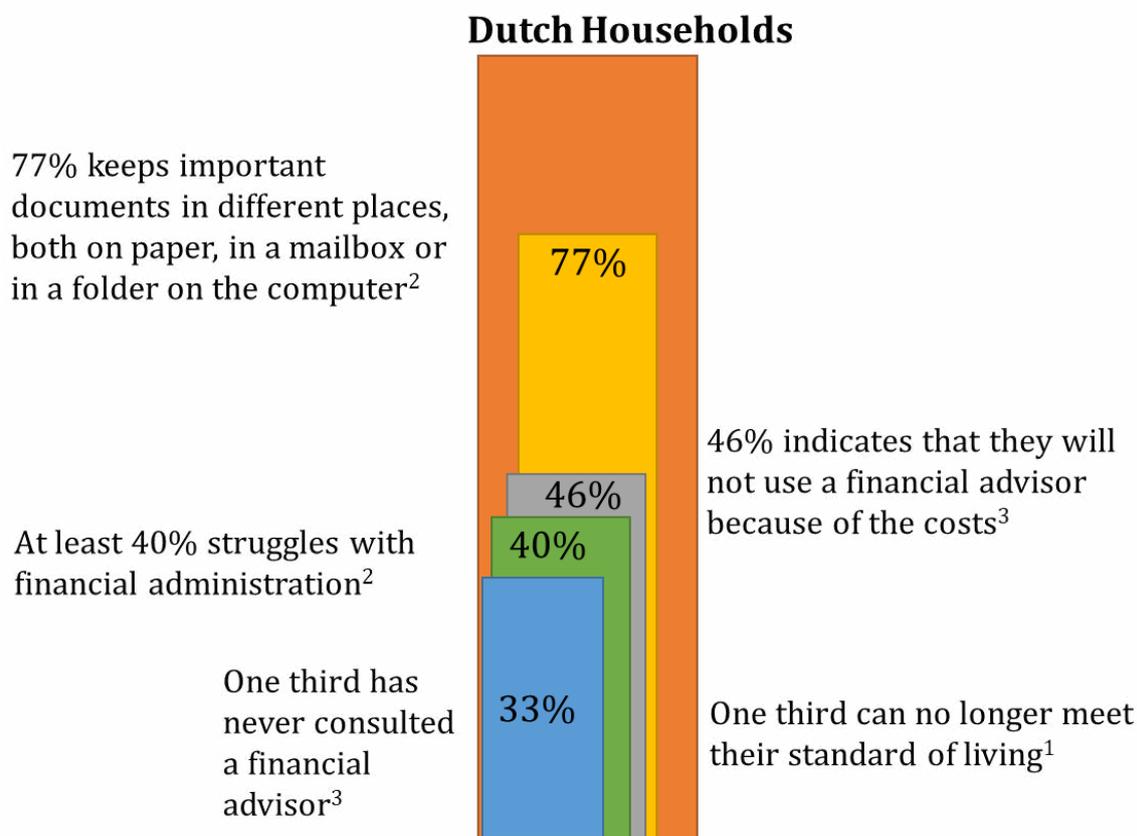
1.2 Problem statement

Currently, it is either difficult or expensive for 'average individuals' to plan their financial future (Knoef, 2018). A recent study on financial advice and planning by Nibud concludes that the relatively high costs of financial advisors is a hurdle for almost half of the Dutch population (Van der Schors & Verberk, 2018). Advisory costs for a mortgage vary between €1500 and €3000. Consequently, one third of Dutch adults have never consulted a financial advisor. Those who have used a financial advisor did so mainly for a mortgage loan, pension arrangement, or funeral insurance. Consumers with below-average income often look for information themselves in order to avoid the costs of financial advice. More than one third (35%) of the respondents in another Nibud study have little confidence in financial advisors (Van Gaalen et al., 2017). It is not clear to them whether the financial advisor acts in their interest or in the interest of the insurer. They also demand more transparency about the work of an advisor and the effect of this advice. Figure 1 illustrates the main numbers.

The problem in deciding whether to employ the services of a financial advisor or not lies in searching and collecting the information needed for a complete financial overview. In order to gain insight, overview, and action perspectives, individuals/households need accurate data about such products as pension products, income, bank savings, insurance products, and loans. Currently, these data are scattered across

1 Service providers can help users to get a tailored financial overview or can recommend certain steps based on a specific scenario (e.g. early retirement or disability). Providing tailored advice may be subject to the Dutch Financial Supervision Act ('Wet financieel toezicht') and require certified advisors.

Figure 1 – Some numbers on financial planning



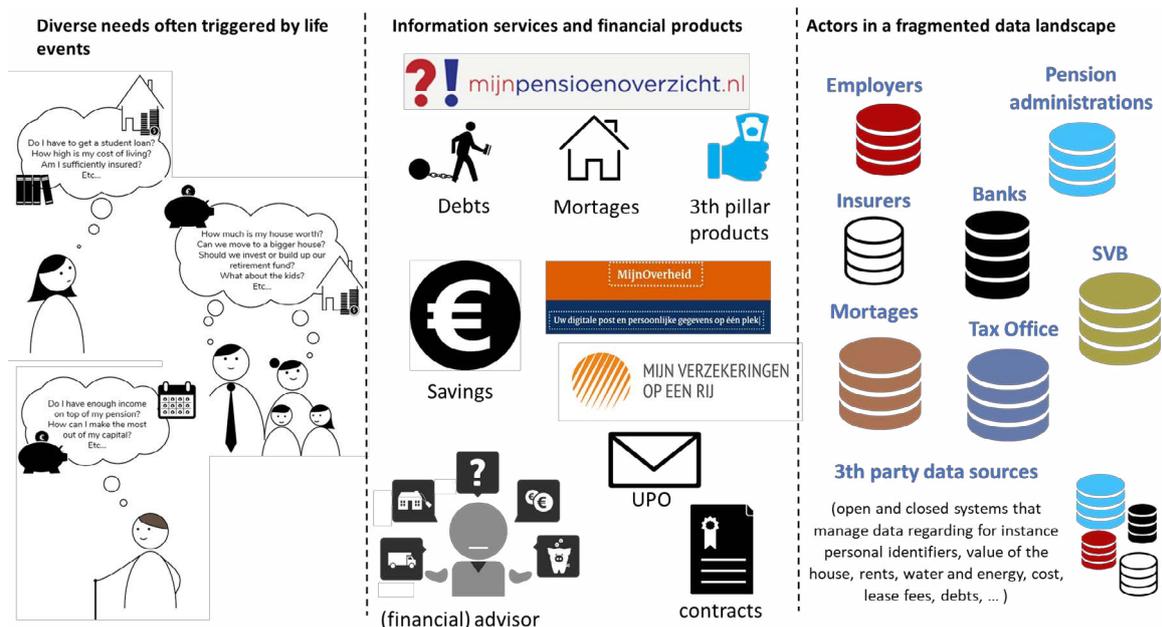
¹ Knoef, M. (2015). Helft van der huishoudens spaart te veel voor pensioen. Het Financieel Dagblad.

² Nibud (2018). Financiële administratie in een digitaal tijdperk.

³ Nibud (2017). Keuzeprocess bij financieel advies.

a large number of heterogeneous actors and systems in various sectors (including pensions, mortgage loans, banks, insurers, tax authorities, and service providers). Figure 2 provides an overview of the necessary data and their fragmentation over many public and private parties. The complexity and diversity of the financial data landscape is increased further by its technological basis. There is a mix of different types of information and communication technologies (ICTs). Some systems are quite old, representing the legacies of mainframe era computerization efforts. Others are very modern, relying on apps, mobile devices, distributed computing, and flexible data structures. This is not unique to the financial domain in general: other domains such as health and public safety display these same characteristics. A challenge for parties that wish to change things is how to connect with the systems of other parties through some sort of network sharing (a gateway or shared hub).

Figure 2 – Fragmented data landscape



Currently, there are several software solutions for professional financial planners (e.g. Figlo and Ortec Finance²) that provide functionalities for gaining insight, oversight, and action perspective. These tools require individuals to collect and share their personal data with professional planners, who enter the data in the tools. These tools are not available to the general public or to persons who are not professional financial planners.

Individuals/households that want to plan themselves can find several portals (e.g. Independer Pensioencheck, ING Pensioenwijzer, Pensioen123) and apps (e.g. Ockto, NN Mijn Inkomen Later, ASR Mijn Pensioenplein). The portals of pension providers usually only focus on second pillar information and do not enable integral financial planning. The Ockto app offers a method to collect and share data, while other apps provide tools for insight into personal pensions. Even so, most of these tools require individuals/households to log into various platforms, to collect or download the data, and to enter data themselves (Knoef, 2018). This is difficult for most individuals (more on this later). Like the tools available for professional planners, there is no extensive data integration with source data systems. One of the more obvious barriers here is that the data needed for financial planning are fragmented over many heterogeneous actors and systems in various sectors (including mortgages, banking, insurers, government, and service providers).

2 An overview of the different tools/apps for financial planning is left out of the final version of this paper but is available upon request.

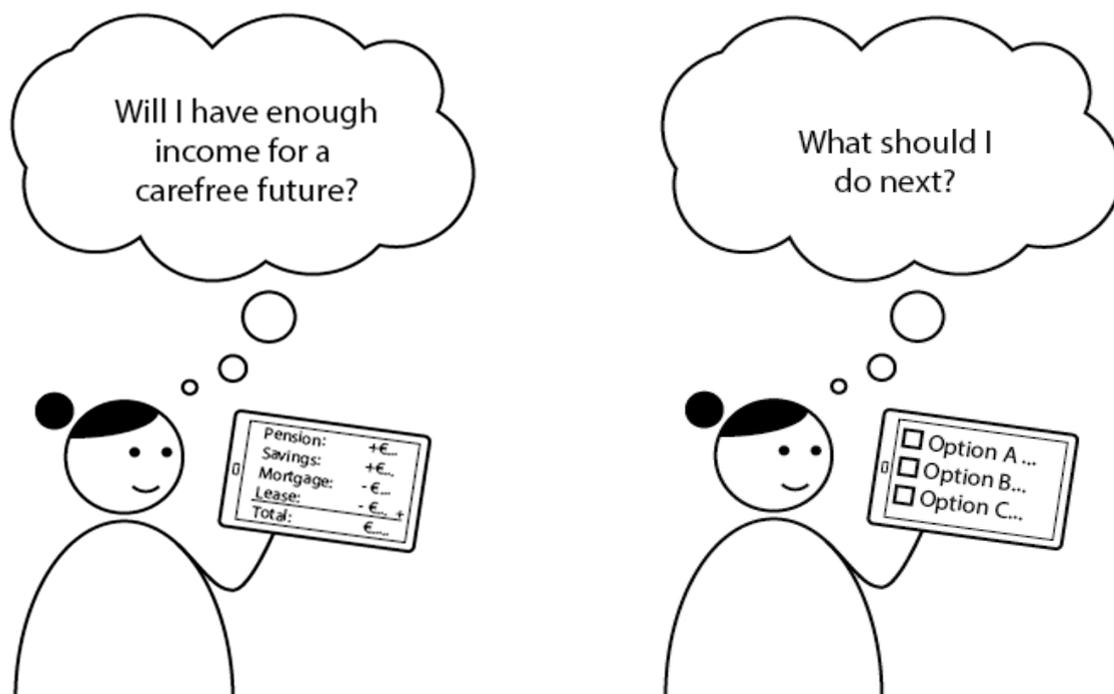
1.3 Research objective & question

The main objective of this paper is to study the information barriers and to formulate design propositions that, when applied, can empower individuals to easily access an integral view of their financial situation for insight, planning, and obtaining advice. Figure 3 provides a simplified view on the anticipated future state in which individuals can easily interact with various organizations in order to get more insight, oversight, and recommendations for action.

The central research question is formulated as follows: *What are the current information barriers, and which design propositions can be formulated to obtain a coherent architecture of components that, when implemented, can enable the cross-domain information sharing needed for personal financial planning?*

A design proposition is not the complete solution for any given problem. Instead, it provides input and guidance for designing a solution (Denyer, Tranfield, & van Aken, 2008). The application of design propositions typically demands much professional knowledge and expertise in the architectural components of information technology, such as digital identities, data, processes, infrastructure, governance, and tools and personal data spaces for individuals, that are necessary for personal financial planning.

Figure 3: Central use case: easy, affordable, and secure personal financial planning based on high quality data



1.4 Scope

This paper focuses primarily on the architecture that is required for information sharing to enable individuals to easily access an integral view of their financial situation for insight, planning, and obtaining advice. We take this narrow focus so that we can go into depth on the subject matter. There are other aspects that are also important for financial planning. The following topics do **not** fall within the scope of this paper:

- Developments of the pension system in the Netherlands.
- Financial decision-making processes and the skills and capabilities of individuals and households.
- Financial planning methods. For purposes of this study, financial planning methods and software are treated as a black box.
- Framing of communication regarding future pension income.
- Behavior of individuals.

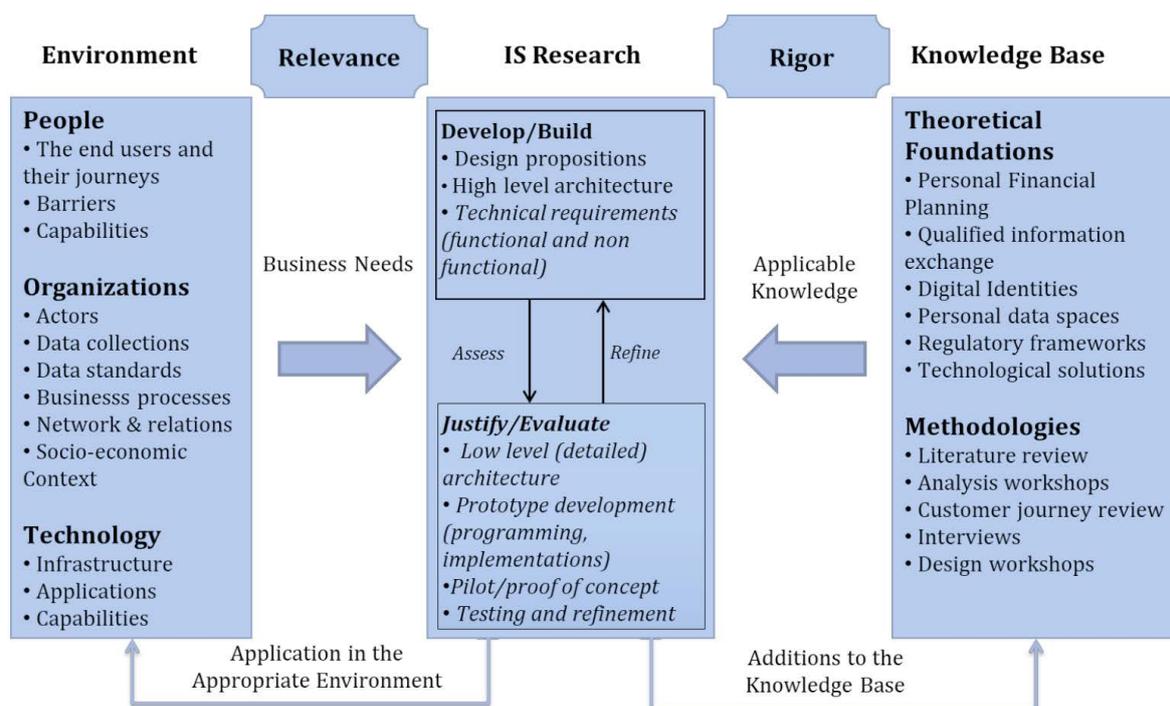
1.5 Reading guide

This paper proceeds as follows. Section 2 provides an overview of our research approach. Section 3 highlights the main developments that are relevant for personal financial planning solutions. Section 4 discusses the main barriers to personal financial planning. Section 5 presents the main design propositions and solution components. The conclusions and recommendations for developing a cross-domain solution are presented in Section 6.

2. Research approach

To achieve the objective stated in the introduction, this research study is based on the design science approach (Hevner, March, & Park, 2004). This approach allows room for the development of solution-oriented or prescriptive knowledge that is relevant for researchers and practitioners. It also provides the procedure that guides us through the processes of real-world problem analysis, theoretical exploration, design, and the development and evaluation of designed components (also known as design artefacts). Such components may include constructs, models, methods, and technical instantiations (i.e. build, deploy, run, and use the component). Following the design science framework provided by Hevner et al., Figure 4 provides an overview of the research methods applied in this study.

Figure 4 – Research framework – *italic text is not in the scope of this research*



We have conducted the following research activities:

1. A literature review on financial planning systems using Scopus (an abstract and citation database of peer-reviewed literature), particularly focusing on barriers and solutions for information sharing and personal financial planning.
2. Semi-structured interviews with experts from the following ten organizations: PGGM, APG, Aegon, Nationale-Nederlanden, Ockto, Stichting Financieel Paspoort,

Figlo, Sociale Verzekeringsbank, Cleverbase, and Ortec Finance. The objective of the interviews was to explore the barriers to personal financial planning as well as potential solutions. An overview of the responses by these organizations is available upon request.

3. Analysis workshops: three-hour brainstorm sessions within the team of researchers, focused on the barriers in the current data landscape that impede information sharing and, ultimately, personal financial planning. We have completed four analysis workshops.
4. Design workshops: three-hour brainstorm sessions focused on addressing the barriers and identifying solution components in a high-level architecture. The solution components are captured in design propositions. We have completed four design workshops.

Please note that the text in italics does not fall within the scope of this research.

Follow-up research is required to develop and evaluate a prototype solution. Section 6 provides some directions for doing this.

3. Context and developments

3.1 Context: ongoing debate regarding the pension system in the Netherlands

Across the globe, financial pressures on collective pension systems are leading to lower projected retirement income and a move away from uniform collective pension agreements (Wendel, Dai, Donkers, & Dellaert, 2016). Recent reforms have made automatic mandatory pension saving less beneficial (Soest, Prast, & Rossi, 2018). The pension landscape is steadily changing. Policy shifts may confront individuals with greater responsibility for their personal retirement planning. Several major shifts can be distinguished that emphasize the need to strengthen **the information position** of individuals. These include:

1. *The need for organizational and domain-transcending information sharing.*

Recent reforms have made automatic mandatory pension saving less beneficial (Soest, Prast, & Rossi, 2018). The financial needs of the consumer thus call for more income than the AOW state pension (first pillar) and the employment pension (second pillar). Therefore, individuals should make personal decisions on, for example, supplementary pension savings or on how to invest their (defined contribution) pension assets. Individuals often have part of the information relevant for this required insight and planning somewhere (e.g. behind the portal of a product provider) but do not always understand it. Besides, some individuals need guidance on financial decisions in general, such as regarding the employer's pension. In this sense, actors in the pension domain (such as pension funds and pension insurers) and in other domains (insurers and banks) can fulfil both a product/service provision role and a (financial) advisory role. For adequate guidance, relevant financial information is also needed from data sources of actors that are not by definition active in the pension landscape (such as tax authorities, the land registry, banks, and real estate platforms such as Funda). This could include information about property value, mortgage details, savings deposits, the household (married or single, children, etc.), energy costs, rental charges, and background data that are known at postal code level.

2. *Need for flexibility and customization.* There are large variations in pension accrual at the personal aggregation level as well as wishes regarding the income after the pension entitlement age. This is an opportunity for offering more flexibility and customization at the personal aggregation level. A transition to personal pension capital accumulation – as suggested by the SER (SER, 2015) – offers better possibilities for this. Dempster & Medova (2011) designed a meta-model for a decision support tool that can be used by financial advisors to assist individuals in their

personal asset liability management (ALM) needs. According to this model, household-specific data are required aside from market and economic data to provide individuals with solid advice. Thus, when a transition to personal pension capital accumulation is supplemented with a better information position and better financial decision guidance, then financial shortfalls and disappointments can be reduced. The interviews conducted reveal that pension funds such as PGGM are looking for ways to use pension data in a GDPR compliant way to improve services or to develop new ones. Think of pension-related data and labor market information, but also data collected in recent years in asset management transactions. These data are interesting in their own right and can also lead to new insights in combination with other data. For instance, by implementing smart algorithms, service providers can find patterns that help them to improve their services.

3. *The importance of privacy and personal data management.* In the current data landscape, various actors each have part of the data of individuals. They use these data for different purposes. The General Data Protection Regulation (GDPR), which became effective in May 2018, sets strict requirements for data collection, processing, and storage (Fennel, Koppejan, Rigter, & Roosendaal, 2018). It is clear that in the data landscape, which the pension domain is part of, personal data management has become increasingly important. Participants must be able to decide which actors may use their personal data for specific services and/or products.

3.2 The rise of personal data management

There is a growing interest in personal data management. Companies need to comply with stricter privacy regulations and increasingly need personal data to perform their task or offer customized services. Individuals wish to maintain control of their data and are at the same time concerned about their privacy. The government is expected to inspect compliancy by organizations with privacy law as well as to inform people. Interest in understanding personal data management is thus growing.

There are six ways in which data can be personal:

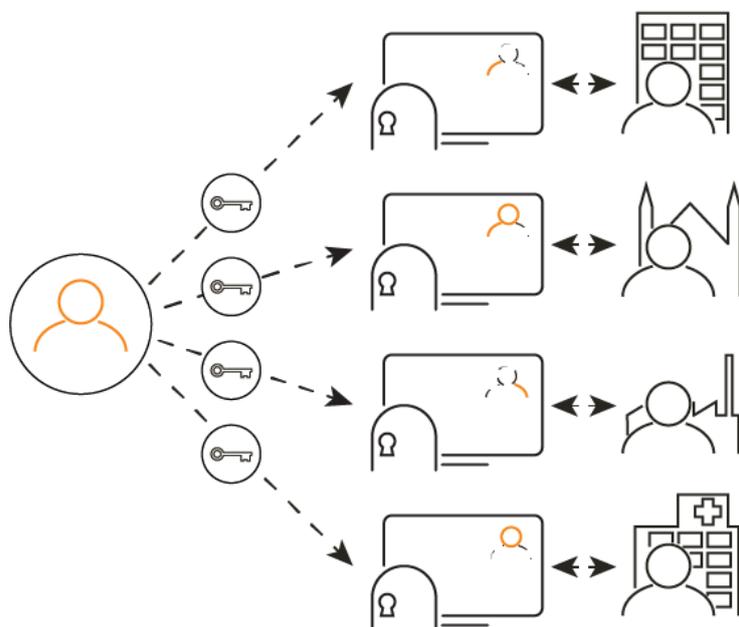
1. Owned by "me";
2. About "me";
3. Directed toward "me";
4. Sent/posted by "me";
5. Experienced by "me";
6. Relevant to "me".

Current conditions for the processing of personal data are often not transparent and possibly even unfair to the individuals whose data are processed.

Giovanni Buttarelli, the European Data Protection Supervisor (EDPS), explains that individuals find it difficult to manage their personal data or even exercise their rights, since the data are stored in a provider-centric system. This serves mostly the interest of the providers to use the data they collect. A human-centric approach is necessary to empower individuals to control and use their personal data.

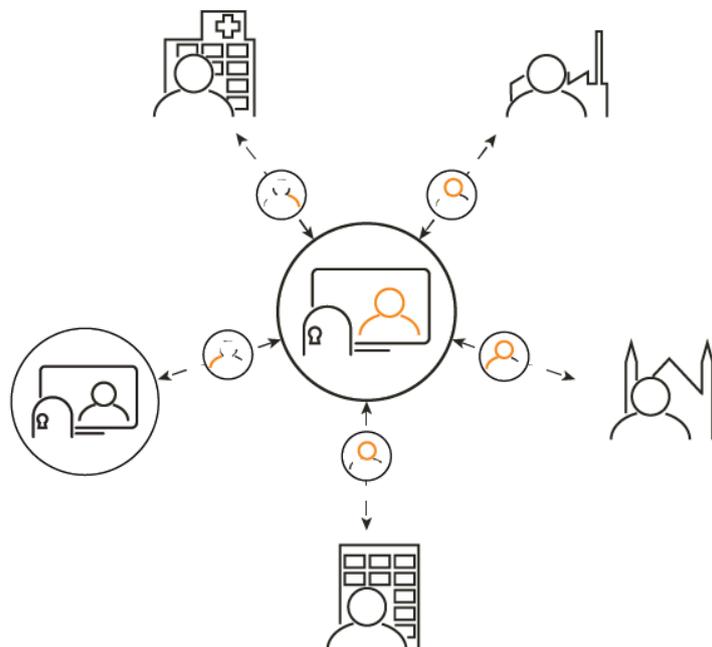
Current architectures are based on provider-centric information-sharing patterns. Figure 5 provides an illustration of a provider-centric architecture pattern.

Figure 5 – Provider-centric architecture pattern



A conceptualization of a more human-centric architecture pattern is a situation in which individuals are able to store their personal data in secure, online storage systems and decide when and with whom to share these data. The data storage has shifted to the user. Emerging technologies such as personal data vaults can play an important part in realizing the human-centric approach. Various designs and business models currently exist. However, they all share the idea of strengthening fundamental rights in the digital world, while creating new business opportunities for solution providers, who would act as intermediaries between the individual and the online services that they use. Figure 6 provides an illustration of a human-centric architecture pattern.

Figure 6 – Human centric architecture pattern



Ideally, the transition towards human centricity and personal data management should allow for more tailored service delivery to individuals. It would open up entirely new industries and business models for serving individuals since they could thereby provide service providers access to their 'complete and up-to-date profile', instead of giving fragmented parts of the puzzle (since the data are scattered across many closed organizational systems). So what should be done to guide this major societal transition towards the human-centric model?

From a regulatory perspective, the foundation has been laid in Europe for the more human-centric approach. On the one hand, the General Data Protection Regulation (GDPR) provides a framework for increased transparency, powerful rights of access, and data portability, giving individuals more control over their data (Voigt & von dem Bussche, 2017). The revised Payment Service Directive (PSD2) proposes similar rights, particularly when it comes to financial data (Cortet, Rijks, & Nijland, 2016). On the other hand, the eIDAS (electronic IDentification, Authentication and trust Services) regulation provides standards for electronic identification and trust services for electronic transactions in the European Single Market (eIDAS, 2014).

3.3 Relevant regulations: GDPR, eIDAS and PSD2

In the current legal landscape, service providers interacting with customers (for financial advice or service delivery) must design processes and systems in compliance with GDPR, eIDAS and PSD2. The General Data Protection Regulation (GDPR) sets strict

requirements for data collection, processing, and storage (Fennel, Koppejan, Rigter, & Roosendaal, 2018). GDPR requires that organizations have a lawful basis when processing personal data. Six of these lawful bases for processing information have been defined. We zoom in on the most relevant GDPR articles in section 4.2.

The eIDAS regulation provides standards for electronic identification and trust services for electronic transactions in the European Single Market (Bender, 2016). Two important concepts in eIDAS are high-level-assurance eIDs and qualified electronic signatures. This framework identifies three levels of assurance for eIDs: low (e.g. DigiD laag, with user name and password), substantial (e.g. iDIN), and high (e.g. eIDs using digital certificates provided under the Public Key Infrastructure of the Dutch government). The level of assurance depends on the level of resistance against reproduction. Considering the developments in the Dutch market for eIDs, it can be expected that within a few years high-level-assurance eIDs will be commoditized and easy to use for individuals. This is important because a high-level-assurance eID is required to place a qualified electronic signature, e.g. in transactions, for administrative procedures, and when signing a contract. A qualified electronic signature is the only electronic signature type that has special legal status in EU member states, as it is the legal equivalent of a written signature on paper. It is a specific type of electronic signature that must meet advanced electronic signature requirements and be backed by a qualified certificate (inked to the eID), meaning a certificate issued by a qualified trust service provider that is on the EU Trusted List and certified by an EU member state. The qualified trust service provider must verify the identity of the signer and vouch for the authenticity of the signature.

The open banking movement and the PSD2 regulation enables consumers to collect their financial data in one place. For this regulation to realize its envisioned benefits, two mechanisms have to work adequately to protect consumers from harm: a rigorous authorization process that ensures that only reputable parties can offer open banking and the consumer's explicit and informed consent (Financial Services Consumer Panel, 2018). The latter should be ensured by the GDPR. However, as recent research has shown, consumer consent is unlikely to protect consumers from harm effectively because it often cannot be considered to be 'informed' due to the lengthy and complex terms and conditions that it is based on (Cortet et al., 2016; Financial Services Consumer Panel, 2018). According to the research, the terms and conditions require a rigorous overhaul before they can serve as a lawful basis for informed consent.

4. Barriers in the current data landscape

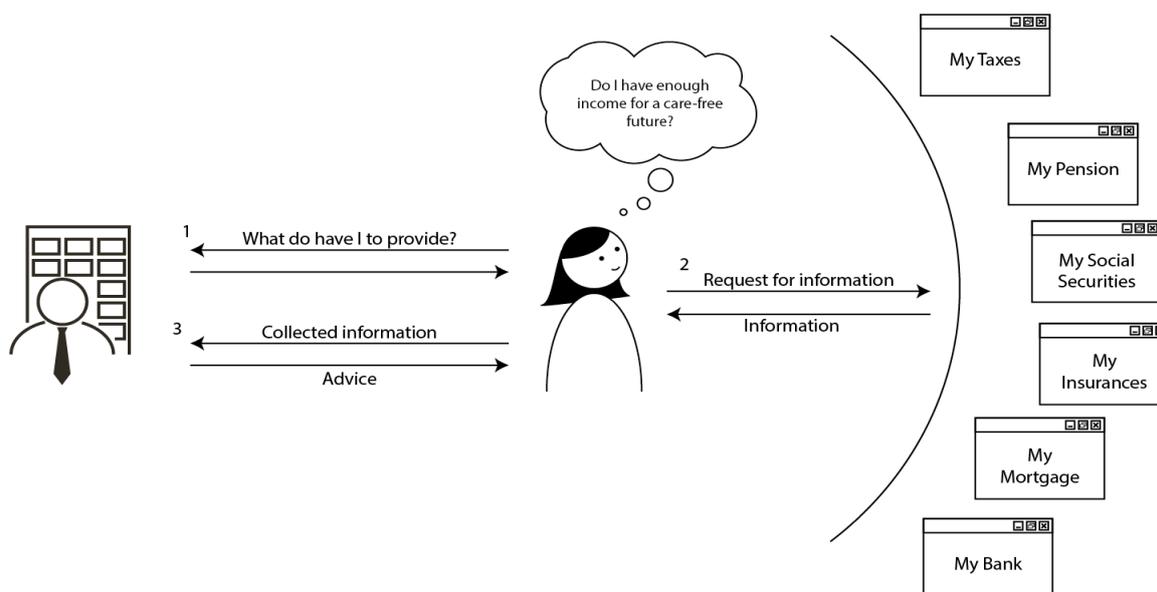
This section provides a preliminary view of the barriers for financial planning. The practical barriers are demonstrated by means of a customer journey, one from the perspective of Willeke and the other from that of service providers. Willeke is a fictitious persona who characterizes the needs and actions of many individuals in the Netherlands. She is a self-employed entrepreneur who wants to be in control of her own financial future.

4.1 Barriers for pension planning

In the current context of pension planning, several barriers exist within the exchange and processing of information between consumers, financial service providers, and information sources. Numerous practical barriers can be identified by analyzing the current process of financial data acquisition. We outline these barriers from two perspectives: (1) the individual/ customer journey perspective and (2) the innovation or service provider perspective.

When Willeke decides that she wants professional help in her personal financial planning, she needs to provide a financial service provider with certain information. This initiates a set of interactions, as depicted in Figure 7.

Figure 7 – Interactions for financial planning



The interactions depicted in Figure 7 are:

1. Willeke needs to find out where to start and what information she needs to provide for her financial planning. The service provider provides Willeke with a list of information and documents that are needed to make a financial plan.
2. Willeke has some of this information in her own records (in digital or paper format) but will need to obtain additional information from multiple organizations. The separately received pieces of information need to be checked manually for correctness and completeness. The various data have to be stored temporarily until the set is complete.
3. When the documentation and information are complete, Willeke sends the entire set to her financial service provider. The service provider checks whether the data are complete and usable and, based on this, creates a personal financial plan for Willeke. When the plan is complete, the service provider sends it to her.

4.2 Data elements needed for financial planning

The previous section shows that Willeke needs information from several sources to make a financial plan. Below we give an overview of the data elements and of the current sources that are necessary for good financial planning. This list is intended to provide a first impression of the sources and domains that we deal with during financial planning. The list is not intended to be complete. Individual circumstances and preferences influence the information needs during financial planning and can therefore vary from person to person.

Table 1 – Examples of data elements needed for personal financial planning (based on Wernsen, 2014).

Data elements	Data sources
Income	Pre-completed tax return (Voor Inge vulde Aangifte/VIA)
Investments and securities	Pre-completed tax return (VIA) or bank
Family composition	Pre-completed tax return (VIA)
Savings & liabilities	Bank savings and loans
Pension savings	Mijnpensioenoverzicht.nl for 1 st & 2 nd pillar pensions
Additional pension insurance	Insurance company of third pillar product
Insurance and social security, such as disability or funeral insurance	Policy sheet from insurance companies
Mortgage or rent	Mortgage loan agreement or rental contract
Communication contracts	Contracts with internet, telephone and TV providers
Utilities	Invoices from utility companies
Study costs or study loan	Dienst Uitvoering Onderwijs (DUO)
Other living expenses and preferences	Questionnaire or averages calculated by Nibud

Collecting and processing personal financial data deserves solid precautions, given the privacy and other rights of those involved. Whenever personal data are processed, the GDPR (2016) applies. The following GDPR articles are particularly relevant and deserve special attention:

- Art 5. Principles relating to the processing of personal data. The main conclusion of this article is that an organization that collects data must be transparent about the purpose of the data collection. The collected data need to be relevant and limited to what is necessary in relation to the purpose. As a result, organizations cannot use or share data in a manner that is incompatible with the purpose.
- Art. 6 Lawfulness of processing. This article sets out that there must be a legal basis for data processing. This can be either permission from the data subject (the person that the data are about) or a need for creation of a contract, compliance, protection of vital interest of the data, performance of a task, or a legitimate interest of the controller.
- Art. 7 Conditions for consent. This article states that when the data processing is based on consent, the controller of the data must demonstrate that free consent has been given. The data subject can withdraw his or her consent at any time.
- Art. 20 Right to data portability. We conclude from this article that, if the data subject so wishes, the organization must provide the data to the data subject. The data subject may reuse the data for other purposes.
- Art. 25 Data protection by design and by default. This article discusses the organizational and technical measures to ensure proper data protection. Products and services should be designed as much as possible with data protection and privacy requirements in mind.

Note that the content of the above articles is not copied in full length here and that the above does not constitute the full set of articles from GDPR (2016). To ensure compliance with privacy legislation, it is important to include this during the design and implementation of products and services. Section 5 discusses the architecture components that are required for compliant and easy use of personal data.

4.3 Customer journey perspective

The barriers that customers face are depicted in Figure 8. Several kinds of life events can trigger the customer journey, i.e. the steps that lead to financial insight and action recommendations. As depicted by Figure 8, several barriers can prevent Willeke from gaining insight into her financial situation, including:

- **Complexity.** Where do I start, and what information do I need? Who has this information, and how do I get it?
- **Variety:** Every information provider has its own information processes. This requires Willeke to learn each time how it works. The various methods to acquire information and the lack of transparency make for a complex process that demands concentration and that can discourage her from seeking financial help or from completing the process.
- **Multiple user names and passwords:** Banks as well as insurers use different credentials. Willeke can obtain some data using her DigiD, an eID that she does not use often and may have forgotten. Obtaining a new password can take days.
- **Inconvenience:** In the paper world, Willeke might have a shoebox or paper file where she stores her data and choices. In the digital world, she can do this on her computer to some extent, but she needs to worry about hacks and back-ups. Moreover, a digital 'folder' on her desktop does not help her to use the data in interactions, as there is no log or trail of how, with whom, and for what purpose she has shared her data. Willeke also has no easy and safe space to store her personal data and her choices.
- **Insecure information sharing.** Willeke does not know whether the exchange of personal information is happening securely. There are no standards in the various methods whereby the financial service providers provide information to her (e.g. email, web portals or regular mail), and she has no control over the security of these methods.
- **A wet/paper signature is still required when signing a contract or providing consent.**
- **Different data definition across public and private organizations:** There are no standards for cross-domain data standardization (i.e. definitions, relations, and syntax).
- **Lack of transparency and control:** Willeke is asked to upload and enter data across various portals, but she has no insight into what happens with her information after it has been submitted, nor does she have any control over how her data are used.
- **Costs.** The direct economic costs in the context of financial planning usually lie with the service provider, as customers are not directly charged for access to or acquisition of information. However, the value of time is an important factor in whether people will seek access to information. In the absence of easy access to an information source, this may inhibit people from accessing information altogether, or it may lead to higher costs than the information seeker is willing to pay.

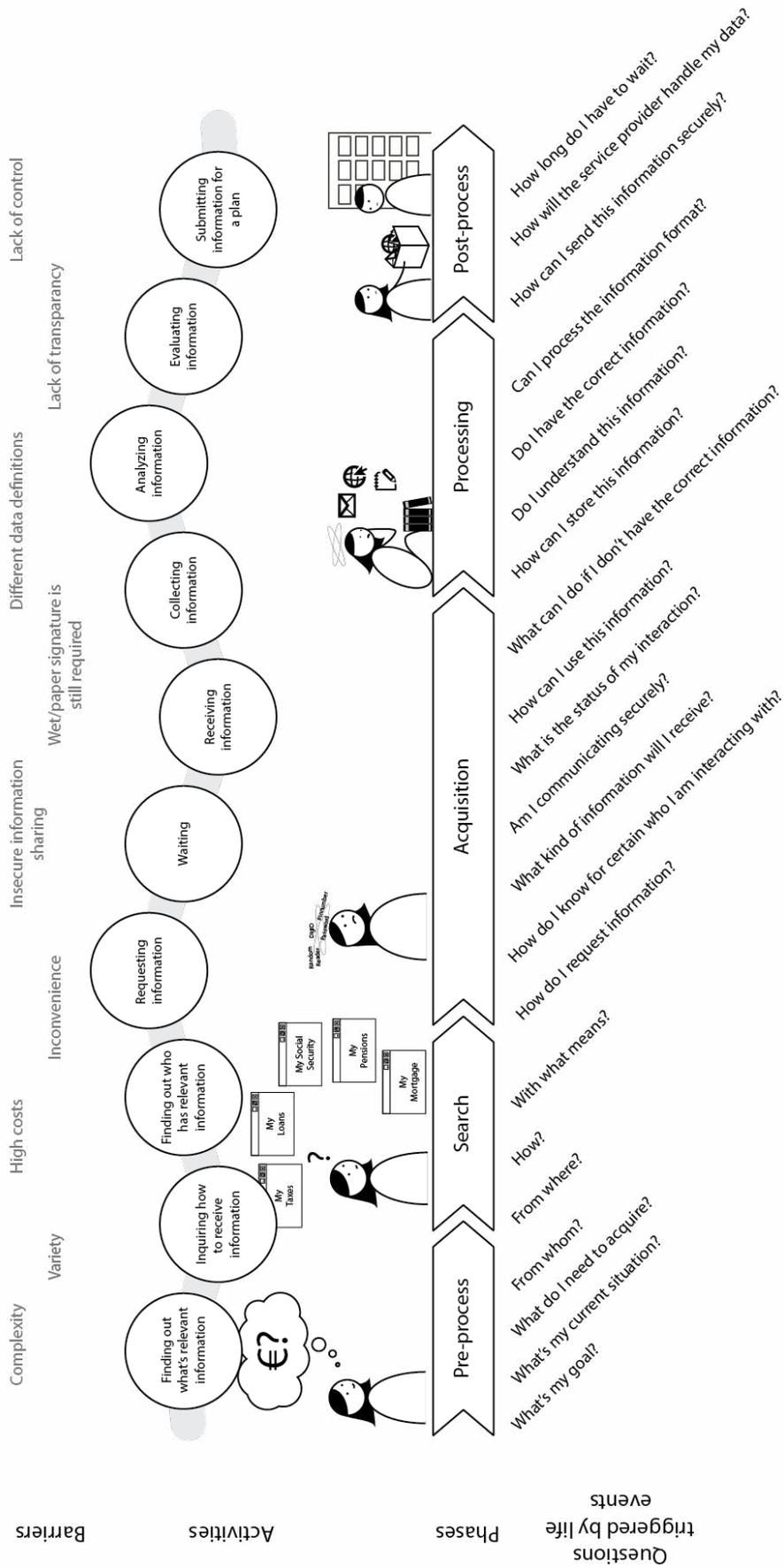
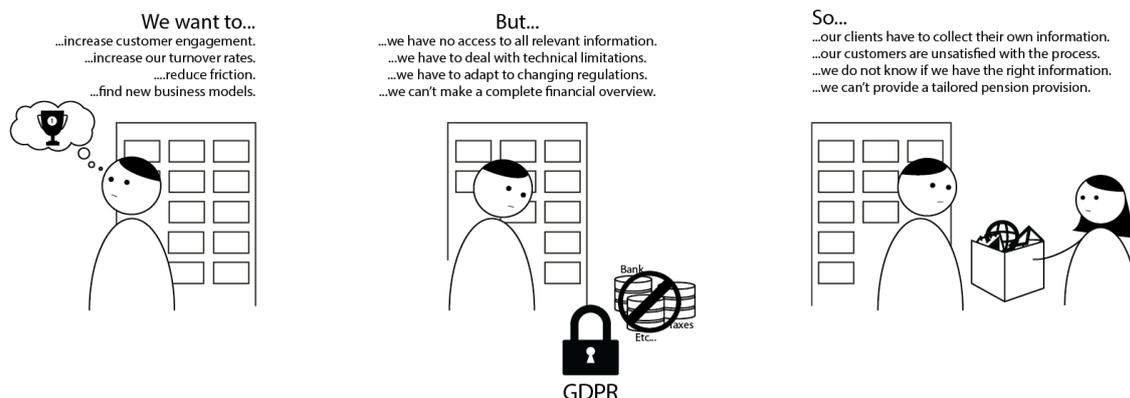


Figure 8 – Barriers in personal financial planning from a Individual/customer journey perspective

Figure 9 – Barriers to innovation from a service provider perspective



4.4 Service provider perspective

The barriers for service providers are visualized in Figure 9. Service providers need personal data in order to better serve current customers based on a complete customer perspective and to experiment with new products and services.

Service providers can be confronted with the following barriers when collecting and processing personal data.

- **Lack of data integrity.** Data integrity ensures the consistency of data. In the current situation it is not possible for the service provider to determine the source of the data or that the data have not changed (intentionally or unintentionally) during the information sharing.
- **Inconsistent and inaccurate data representation.** To ensure data accuracy, data must be represented in a consistent and unambiguous form. Since there is no cross-domain data model or taxonomy for the specification of financial data (syntax and semantics), the data received from the various sources can have different formats, structures, and definitions. To use the data, service providers may need to map and convert them manually, based on internal data models. This makes data analysis and processing inefficient and expensive.
- **A wet/paper signature is still required when signing a contract or requesting consent.**
- **Non-availability of systems.** Connectivity to various organizational systems in various domains. All these system-to-system connections (interfaces) need to be managed.
- **Non-compliance with regulatory demands:**
 - *GDPR.* The General Data Protection Regulation aims to increase the protection of the privacy rights of customers and sets out that organizations hold a high responsibility with regard to personal information. GDPR requires service providers to obtain explicit customer consent for collecting personal data.

Compliance with the GDPR regulation involves high investments in tools and procedures.

- *eIDAS*. The electronic IDentification, Authentication and trust Services regulation of the EU regulates technical and procedural standards for digital identification, authentication, and signing for organizations in the public sector.
- *PSD2*. The Payment Services Directive 2 is the new European Directive on consumer and business payments. PSD2 allows providers of new online payment and account information services (e.g. FinTech's) to enter the banking domain. They can act as an online third party between consumers and their bank, if the consumer has provided consent.
- *Awb (Algemene wet bestuursrecht)*. The General Administrative Law Act sets out the responsibilities of 'administrative authorities' in relation to individuals and legal entities. The Act prescribes when and how an administrative authority can propose a digital channel for exchange of information. Digital exchange is allowed if the reliability and confidentiality of the proposed channel are in line with the seriousness of the goal and content of the exchange.

Basically, service providers can follow either of two data collection strategies. Either the service provider needs to implement and maintain various system-to-system connections to external systems (e.g. tax authorities or banks) and to query the data (request-response), and then to check, transform, analyze, and feed them to the back-end processes and applications. Not only does this require a lot of effort, it also leads to more fragmentation and non-compliance with the purpose limitation under GDPR. Alternatively, customers must deliver their data to the service provider directly, for instance via a web portal. This seems a viable option. However, from Willeke's customer journey we learned what this requires of customers: it has a negative impact on her experience and her likeliness to seek financial planning. The challenge faced is to find a solution that overcomes these barriers in a user-friendly way.

5. Design propositions and solution components

We have developed components that we propose for removal of the thresholds that individuals and financial service providers face in financial planning. These proposed components result from our research into design propositions concerning technology and governance.

5.1 Design propositions on technology

Technology – to be more specific, information technology – has contributed greatly to the way individuals and organizations collect, store, retrieve, share, and process data. As societies have started to use information technology for more formal information dialogues, such as filing tax returns or looking into medical records, policymakers have imposed ever increasing requirements on how these formal information dialogues should take place. Regulations such as GDPR and PSD2 impose a broad set of design requirements, including privacy by design and data portability. There is a great need for legal certainty, both from a consumer and a service provider perspective. The question is how the actors involved can design systems across organizations and domains that are judged to qualify, given the various types of design requirements.

Basic components needed for qualified information sharing

Previous work by Van Wijk et al. (2016) has led to a design theory or conceptual framework that provides guidance on the development of inter-organizational information sharing systems. Their work has coined the concept of qualified information exchange (or sharing) as a design goal or dependent variable. Qualified information sharing is the transfer of data (structured as well as unstructured) in the formal relation between two or more natural or legal persons. It is 'qualified' in the sense that the data transfer is effective, reliable, confidential, and irrefutable. For qualified information sharing, Van Wijk et al. (2016) suggest that the development of inter-organizational systems requires a holistic or integral configuration of the following inter-organizational information sharing components: eIDs, data, processes, technical interface protocols, and support. We propose that the following solution components are needed to support financial planning.



eIDs. Considering the confidentiality of financial data, as well as the requirements of the eIDAS (electronic IDentification, Authentication and trust Services) regulation, we suggest that high-level-assurance IDs provided by Qualified Trust Service Providers (QTSP, a term coined by eIDAS) are needed. QTSPs, as already exist in the Netherlands, can provide high-level-assurance IDs that are affordable and easy to use via various devices.



Data. A cross-domain data dictionary (taxonomy) is needed for the data that are relevant for personal financial planning. Prefilled data (similar to your tax return) should be the norm, as users who work on a financial plan should only have to type in a minimal amount of information themselves. Data standards such as XBRL and XML have proven to work quite well for the standardization of data elements in other domains (Bharosa, Van Wijk, De Winne, & Janssen, 2015).



Processes. The automation of high volume data preparation, exchange and processing requires process standardization, especially on how data moves from a personal data space to a service provider and which checks need to be performed (e.g. authentication, message format and size check). An important design principle here is 'compliance by design', which includes 'privacy by design' (as compliance covers more than just privacy). Privacy-by-design means that systems – and the governance of these systems – are developed to guarantee individual privacy. Privacy-by-design does not mean that data cannot be shared. Privacy-by-design should also include measures to compromise privacy for the sake of national security. Privacy enhancement mechanisms are needed to increase data circulation. Other key principles in GDPR are data minimization and data portability (Voigt & von dem Bussche, 2017). Data processing should only use such data as are required to successfully accomplish a given task. Additionally, data collected for one purpose may not be reused without further consent.



Technical interface protocols. To enable information sharing across domains, we suggest that actors build a lean and secure information infrastructure that does not store personal financial data, but only facilitates their exchange. Research demonstrates that this can be done using tokenization technology (Dijkhuis, van Wijk, Dorhout, & Bharosa, 2018), similar to what is used in many blockchains (Ølnes, Ubacht, & Janssen, 2017). Tokenization involves exchanging signed surrogates as pointers for real data that are securely stored in the edge systems (i.e. the personal data space of individuals or organizations). For interfacing, we will use open and easy-to-implement API standards based on Representational State Transfer (REST)³.



Support. Actors using the design components need support on implementing the standards alongside their own systems. They also need incident and help-desk services in case of technical issues (e.g. when the exchange infrastructure

3 REST is an architectural style for creating web services.

is down). There are no clear-cut ideas as yet regarding user support. A possibility might be to contract a third-party service provider. One of the key roles of governance bodies (discussed in the next section) is to select such a third party and implement such support against predefined costs and service levels.

Other components needed for personal financial planning

The design components listed above are the missing pieces in the current landscape, which already includes several portals and personal financial planning apps (see Appendix B). Basically, the latter include two additional components needed for personal financial planning:

- Personal data space/vault: an online environment in which users can receive, view, analyse, update, delete, and share data.
- Functionalities for generating insight (what is my financial position?), oversight (will it be enough?) and action recommendations (a financial plan).

When combined in an applied configuration, these components should form an information sharing platform that can be used by all actors in the financial domain. This includes the organizations that provide a portal (e.g. PGGM and NN) as well as personal financial planning software providers (e.g. Ockto and Figlo). These organizations have the knowledge, functionalities (based on algorithms), and business incentives to facilitate personal financial planning.

These components are by no means definitive. In the future, fully automated advice algorithms based on big data may come to play an important role in the financial advice landscape for many products, both as stand-alone models and as tools for advisors. But at this time, it is not yet clear whether service providers can move beyond simple investment solutions and capture individuals and households at scale, and still replicate the trust and intimacy of a human advisor. The potential exists, but the jury is still out.

5.2 Design propositions on governance

When it comes to information sharing for personal financial planning we face an 'institutional void' (Hajer, 2003). What we mean to say is that there is no form of governance that steers the adoption and use of standards that enable personal financial planning. Because no single actor (e.g. pension administrator) can impose the standards for design components on other actors (in the pension domain and in other domains such as mortgages, banking, insurance, and public agencies), the efforts of a single actor can never enable the level of cross-domain information sharing that is

needed for personal financial planning. A single actor can use simulated or fictitious data or even ask customers to manually type in financial data via its portal to a financial planner, but then Willeke still has the same problem. Personal financial planning without the barriers identified in the previous section requires joint coordination and standardization across domains. Governance encompasses the arrangements that actors engage in order to allocate decision-making, manage shared resources, and enact mechanisms for coordination and resolution of differences (Klievink, Bharosa, & Tan, 2016). Governance can extend from a primarily strategic activity to an administrative set of processes. For this paper, governance encompasses strategic, tactical, and operational endeavors.

How can we jumpstart a governance effort that evolves into something effective and sustainable? Which constellation of actors is needed, in what bodies should they be organized, how often do the governance bodies meet, which decisions should they make, and how are decision rights distributed? When it comes to answering these questions and designing a governance that is both effective and sustainable, we fail to find a generic formula in the literature on the subject. However, several useful criteria are pointed out in the literature. We analyze these below on their usefulness for shaping an initial version of the governance structure within the research that we propose:

- **Legitimacy.** There must be a legitimate reason or public goal why different actors – some of whom may be competitors – meet on a regular basis, exchange knowledge and decide collectively on the next steps to take.
- **Ownership.** Ideally, governance is carried out by those actors who have rooted interests in solving problems (i.e. information sharing for personal data management). These actors will be affected by the outcomes of the decision-making process.
- **Broad stakeholder involvement and full representation.** Relevant actor groups should be represented for governance to be effective.
- **Awareness of mutual dependency and chain responsibility.** Actors should acknowledge the role they play in the ecosystem and act upon this role.
- **Acceptance.** Actors are willing to abide by the rules and arrangements that follow from decision-making through proper governance.
- **Separation of concerns.** Strategic, tactical, and operating level decisions are needed to cope with complexity and require different levels of knowledge and mandates.
- **Strategic fit.** Governance should be aligned with the design questions and challenges at the technical level. In other words, there should be adequate knowledge

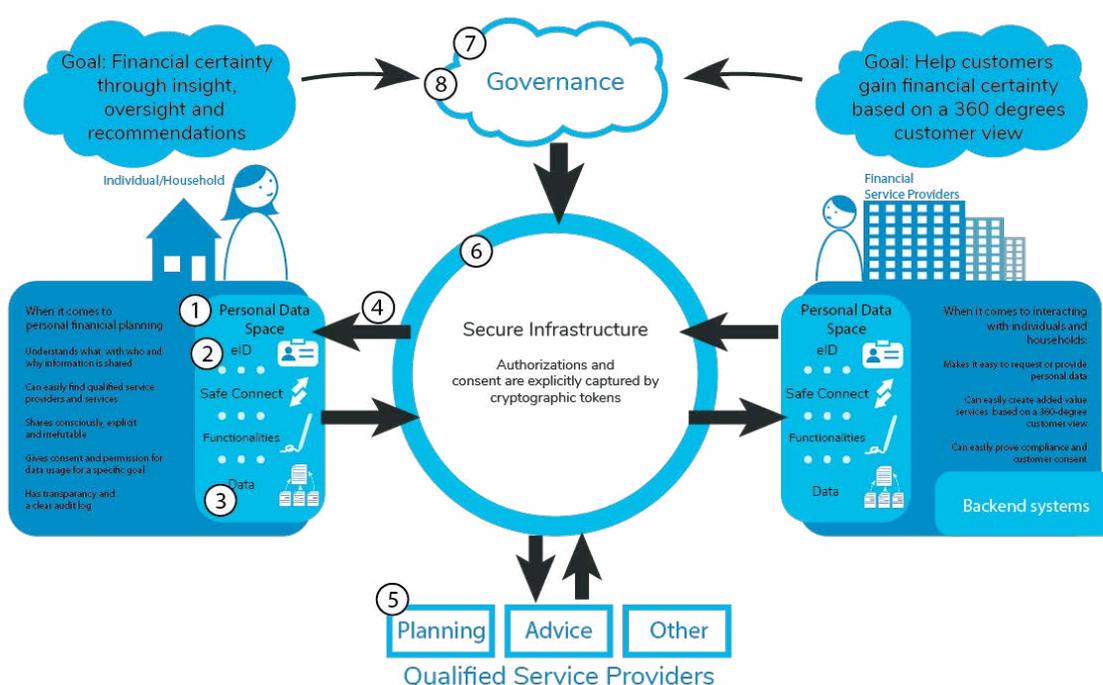
and mandates within the governance activities to address the technical challenges. The five design components mentioned earlier are categories in which technical challenges need to be analyzed and decided.

- **Checks and balances.** Decentralization of power should promote consensus and decisions that are aligned with the interests of all stakeholders. Mechanisms such as supervisory boards and regular audits can also stimulate 'good governance'.
- **Transparency.** The agenda and decision notes of the governance bodies should be transparent to all members. Conditions for entering or leaving these bodies should be clear up front.
- **Adaptability.** Changes in the environment, expectations from customers, the global economy, and new technologies require governance structures to adapt (Janssen & van der Voort, 2016). If the governance structure does not adapt, it will become unstable and dissolve.

5.3 Synthesis: a high-level architecture for personal financial planning

This section discusses the design propositions for removing the barriers listed in the previous section. The goal is to inform readers on *how* we expect to remove the informational barriers. Figure 10 captures the relationship between the components included in the design propositions.

Figure 10 – The big picture: the proposed solution components for personal financial planning



These design propositions are rooted in the literature. As stated in the introduction of this proposal, our key design premise for removing the barriers is the need for standardization of two categories of design artefacts: technology and governance. Below we give a short explanation of the proposed solution components.

- (1) Personal data spaces for secure personal data management. From this landing space for qualified interactions with data, individuals can easily retrieve the data that they require from the various segments. The user can easily save, view and, where necessary, complete the data. Users decide with whom they want to share their data and for which specific goal these data may be used.
- (2) Easy-to-use high-level-assurance electronic IDs linked to the personal data spaces and enabling qualified electronic signatures. Individuals and organizations can identify themselves safely and easily with existing tools, such as a mobile phone. High-quality eIDs ensure that individuals can clearly identify the data and with whom they are shared. As proposed in the eIDAS framework, high-level-assurance eIDs can be used to sign documents with a qualified electronic signature, abolishing the need for a follow-up paper trail in customer journeys.
- (3) Data specifications (standardization of syntax, semantics, and structure) allowing for the automated processing (without manual rekeying or conversion) of data exchanged between systems. Agreements on data standardization serve to avoid the need for retyping or conversion of data, which saves time and prevents errors.
- (4) Compliant interaction processes for automation of information collection, exchange, and processing during personal financial planning and service delivery. Such processes need to be clear for individuals and service providers and must specify the legal context in which interactions take place (Dijkhuis et al., 2018). An individual must be able to take a position with respect to the formal submission and acceptance of information by means of a qualified signature within the personal data space. A best practice used in standard business reporting is that the interaction processes are unequivocally defined and published using the Business Process Modelling Notation (Bharosa, Van Wijk, De Winne, & Janssen, 2015). Compliance by design should be the leading design principle, followed by ease of use in the various steps of the customer journey.
- (5) Remotely accessible tooling/features for data aggregation, analysis, and planning (self-service) or via submission of personal data to a specialized financial planner (request-response). Existing and new tools for financial planning can connect to the solution components. These tools provide, among other things, insight into the personal financial situation, calculations such as risk assessments, and

initiation of action perspectives, including the purchase of financial products and services.

- (6) Secure technical interfaces (APIs) for information sharing (posting and retrieval of data) that can be used by all actors across multiple financial domains. For each data exchange it is clear by whom, with whom, and for what purpose (consent or necessity) the data are shared.
- (7) Support for organizations that wish to use the previously mentioned components. The expert parties that supply components can provide support. In this respect, agreements must be made based on the governance model. This support applies both during the implementation and the use of the components.
- (8) A cross-domain public-private governance that steers the development and adoption of the infrastructure. No single actor has all the capacities, skills, and knowledge to set up all components nor owns the entire set of necessary data. Moreover, no single actor can enforce the standards for the design components on other actors. A functioning governance is a prerequisite for the success of the cross-domain infrastructure.

5.4 Incentives for actors to adopt the design propositions

Why would actors choose to adopt the design propositions? Our interviews reveal various motivations for government agencies and financial sector companies (i.e. pension administrators, insurers, mortgage providers, and banks). Governments tend to prefer *transparency* of finance and *autonomous citizens* who are empowered to handle their own financial situation. Giving individuals more financial oversight and insight – making them more financially self-sufficient – is a recurring policy objective that resonates with the objectives to shift more responsibilities to society and to cultivate a smaller and more efficient public sector. Governments already have taken actions by developing regulatory frameworks, such as the GDPR, to give more control to individuals over their personal (financial) data that are scattered across organizations (personal data management). By stimulating the adoption of the design propositions, government agencies can contribute to more individual control, autonomy, and financial self-sufficiency.

Four other incentives stand out when it comes to companies in the financial sector. First, giving individuals the tools for obtaining integral financial oversight and insight in a *customer-friendly* manner helps satisfy customer needs and nurtures loyalty. The importance of loyalty and a positive brand image cannot be overestimated, especially when individuals can choose between more and more service providers, in the future perhaps even including pension plans.

A second incentive is that for more *customized service delivery*, organizations need more personal data. If you can nudge customers to share more of their data with you, then these companies can provide more relevant and customized services faster (e.g. insurance plans, pension plans, financial plans). Especially since the enactment of GDPR, processing more customer data without the explicit consent by individuals is unlawful. So, organizations need to seduce customers to bring their data to them and provide explicit consent.

A third incentive related to obtaining more personal data is the capability to explore *new business models* (business model innovation). Knowing your customer is an important asset for exploring new value propositions, cross-selling, and up-selling.

The final incentive is the increasing risk of intermediation by big-tech companies that enter the financial sector. Companies such as Google, Samsung, and Apple are preparing to enter the financial sector. This year, in 2019, Google has been granted an authorization in Ireland under the Payment Services Directive 2 and is now able to acquire and issue payments anywhere in the EU under passporting rights. The Bank of Lithuania granted Google Payment an electronic money institution license, authorizing it to issue and redeem electronic money as well as to provide payment services. In Asia, the number of financial transactions handled by WeChat is already astronomical. Big-tech companies – which are already well known, relevant (used more than a toothbrush each day) and trusted⁴ by individuals – might disrupt the financial sector faster than expected. New tech entrants can become the gateway and mediator between individuals and banks, pension funds, insurance providers, and mortgage providers, realizing high profit levels and forcing the financial service providers into a price race to the bottom. We have seen this level of disruption in other domains: Uber – the world's largest taxi company – owns no cars; Alibaba – the biggest retailer – has no inventory; and Airbnb – the world's largest accommodation provider – owns no real estate.

We do not know whether the above incentives are recognized and considered serious enough for the various organizations in the financial sector to take collective action soon. This leaves us with an interesting question for further research.

4 A recent study published in Het Financieel Dagblad (December 10, 2018) revealed that 54% of 2,500 individuals surveyed in the Netherlands would rather trust big-tech companies with their money than the traditional banks (who have very low and even negative sympathy scores).

6. Conclusions and recommendations

6.1 Conclusions

Many individuals and households lack insight into and oversight of their complete financial position. Those looking to create an integrated financial overview often face the following information barriers: not knowing where to start, no single information source, having to remember multiple digital identities, time-consuming data search (paper and digital) and manual data entry processes (that vary across organizations), the need for wet signatures (on paper), different data definitions, and lack of control over how the data are used.

Our main design proposition is that removal of the barriers identified requires collective action across the various financial domains (i.e. pensions, mortgages, banking, insurance, and public services). Collective action is needed to develop and govern a cross-domain infrastructure for information exchange, for both personal financial planning and tailored service delivery. This paper identifies the following solution components (or building blocks) for such a cross-domain infrastructure: (1) personal data spaces for secure personal data management (landing space for qualified interactions with data), (2) easy-to-use high-level-assurance electronic IDs linked to the personal data spaces and enabling qualified electronic signatures, (3) data specifications (standardization of syntax, semantics, and structure) allowing for automated processing (without manual rekeying or conversion) of data exchanged between systems, (4) remotely accessible tooling/features for data aggregation, analysis, and planning (self-service) or via specialized financial planning tools (request-response), (5) compliant interaction processes for automation of information collection, exchange, and processing during personal financial planning and service delivery, (6) secure technical interfaces (APIs) for information sharing (posting and retrieval of data, including consent), that can be used by all actors across multiple financial domains, (7) support for organizations that want to use the previously mentioned components, and (8) a cross-domain public-private governance structure that steers the development and adoption of the solution components.

6.2 Recommendations for further research

The main limitation of this research is that we did not develop, implement, and evaluate these components with financial service providers, data providers, individuals/households, and financial planning tool providers. This raises questions such as how to proceed and who should develop the components. These questions surfaced during

some of the interviews and have some significant research and development aspects. We anticipate three possible scenarios.

Scenario 1: A coalition of financial service organizations joins forces and develops a cross-domain information infrastructure that enables information sharing for both personal financial planning and tailored service delivery. Why would they do this? The interviews revealed both a service-driven reason and a competition-driven reason. The service-driven reason is that a set of competing financial service organizations acknowledge that they cannot provide an integral financial plan by themselves because they do not have all the necessary data. The more competition-driven reason is the fear of being disrupted by a big-tech firm which could develop into an intermediary preferred by consumers. Big-tech firms can enter the market and take over direct customer contact because of their large cross-domain service portfolios. Regardless of the reason, such a coalition of willing organizations can lead the cross-domain development of an infrastructure. Since they will incur the investment risks and associated costs, they can set the rules for using the components. In line with the observation that service providers are more and more becoming 'tech firms' and the expectation that companies work quickly and efficiently (compared to government bodies), this scenario seems quite likely. However, the challenge is to initiate such a coalition that spans across industry borders. Who leads the initiative? A bank, mortgage provider, insurer, or pension service provider? None of these can successfully enable personal financial planning by itself (for the reasons discussed earlier in this paper). For some financial products (e.g. mortgage and insurance services) there may be competition. Perhaps a coalition of complementary parties is needed. How would such a scenario play out in terms of dependencies and power distribution across organizations? Will the rest of the financial industry trust the coalition to serve their best interest? Organizations might be reluctant to use an infrastructure which is operated and controlled by one or more competitors. This scenario highlights the fact that we face a collective action problem. As discussed by Olson (1971), a collective action problem is a situation in which all organizations would be better off cooperating but fail to do so because of conflicting interests between organizations that discourage joint action.

Scenario 2: Governments take the lead in developing a cross-domain infrastructure for sharing and storage of personal financial information. Private parties can connect to this platform and offer or request services and data for personal financial planning. They communicate with their customers through this platform with the use

of personal data spaces. This also seems to be a plausible scenario. However, there are also some obstacles here. First and foremost, in this era of 'small or minimal government', how will policymakers justify the spending of taxpayer money on an infrastructure that would also benefit the financial industry? Second, developing a cross-domain infrastructure would be no small feat from an information technology perspective. Considering the recent failures of large information technology projects in the public domain, it will be a political challenge to gather support for such an initiative.

Scenario 3: Research-driven public-private collaboration. In this scenario, scientific research questions and methods guide the configuration and design of the components needed for personal financial planning. The goal is to configure, build, and test the most appropriate configuration of components, based on a continuous interaction between research and practice. Universities and knowledge institutes can contribute knowledge (theories and concepts) and research methods in an e-laboratory (technical environment) for the building, connection, and testing of components. Industry partners can contribute components (e.g. digital eIDs, use cases, details on customer preferences, and functionalities). Government bodies can contribute legal and policy frameworks and ensure that the rights of persons are protected.

We suggest that a partnership of public and private organizations, that really want to enable integrated personal financial planning, should work towards scenario 3 (even if they started with scenario 1 or 2 in mind). Several conditions should be met in this scenario. First, the partnership must be open to all parties willing to contribute and that the components that are developed use open standards. Openness and knowledge sharing are highly important; government agencies and knowledge institutes should play an active role here. Second, explicit government involvement is needed to boost legitimacy and confidence on the part of the financial sector that the resulting components are credible and acceptable for future large-scale adoption and use. Third, the information infrastructure must be neutral (not owned by a specific organization or sector). The collective output should not result in a monopoly where a single actor can exploit the components. If the components developed during the research phase work well in practice, meaning that they help remove the information barriers for personal financial planning, then further development, commercialization and adoption can take place by the initial public-private partnership. At this point, the role of researchers and universities can be phased out, followed by transition from a research mode of governance to a more service delivery or production mode of governance as the components are implemented and used in real life by real users. This scenario would complete the design science approach presented in Section 2.

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This is a publication of:
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E-mail info@netspar.nl
www.netspar.nl

March 2019