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Modularbank Subscription Platform Analysis and Design

Master's thesis

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Modularbanki renditellimuste platvormi analüüs ja disain

Magistritöö

Juhendaja: Ove Kreison
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Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

The aim of the thesis is to design a software solution as part of the existing Modularbank platform to support the provision of car subscription to retail customers as a digital service. Prior to undertaking design, a multi-stage research and analysis process is conducted. An overview is compiled of recent trends in global FinTech and car industries with a focus on their intersections. The strategic motivations of Modular Technologies OÜ, owner of Modularbank, and AFS (alias for an automotive OEM) are studied in terms of their interest in entering the subscription market as a software and service provider, respectfully. The vehicle subscription business value stream and business glossary are drafted. User and functional requirements of the solution needed for car subscription digital origination and provision are compiled. Business rules and overall business information model are drafted. An overview is provided of the architecture and technological pillars of the Modularbank platform as-is. A gap analysis is conducted between existing and target architecture for Modularbank as a subscription platform, concluding that several existing modules can be used for supporting subscription and two new modules need to be developed – subscription and assets. Also, a number of external integrations are needed with specialised service providers (document verification, insurance etc.) and a subscription app to be developed. A component diagram is drawn up for Modularbank subscription platform and entity relationship diagrams drafted for the two new modules.

This thesis is written in English and is 53 pages long, including 8 chapters, 23 figures (including 9 in appendices) and 6 tables (including 3 in appendices).

Annotatsioon

Modularbanki renditellimuste platvormi analüüs ja disain

Magistritöö eesmärgiks on kavandada renditellimuste platvorm osana olemasolevast Modularbanki peamiselt finantsteenuste pakkumist toetavast lahendusest. Renditellimuste platvormi esmased olulisimad funktsionaalsused hõlmavad digitaalset lepingulise renditellimussuhte algatamist eraisikuga sõiduauto rendiks keskmiselt pikaks perioodiks, lepingu muutmist ja arvete koostamist osutatud teenuste eest.

Lahenduse kavandamisele eelnevalt koostatakse ülevaade üleilmsetest suundumustest finantstehnoloogia ja sõidukite valdkondades, rõhuga nende kokkupuutepunktidele. Järgnevalt analüüsitakse magistritöö keskmes olevate ettevõtete – Modular Technologies OÜ ja autotootjast näidisettevõtte AFS – strateegilisi lähtekohti ja ajendeid sõidukite renditellimuse turule sisenemisel.

Magistritöö mahukaimas osas analüüsitakse sõidukite renditellimuste äri ja nõudeid infotehnoloogilisele lahendusele, mis võimaldab teenust pakkuda digitaalse protsessina. Koostatakse ärikirjeldus ja -sõnastik ning väärtusvoog. Pannakse kirja kasutajanõuded jaotatuna üheksa vajaliku võimekuse alla, millest antakse koondülevaade kasutusmallide mudelitel. Kirjutatakse lahti funktsionaalsed nõuded, koostatakse olulisimate äriprotsesside mudelid, ärireeglid ja üldine äriinfo mudel.

Peale olemasoleva Modularbanki platvormi arhitektuuri ja tehnoloogia alustalade kirjeldust viiakse läbi lünkade analüüs, mille käigus selgub, et renditellimuse platvormi jaoks saab kasutada mitmeid olemasolevaid mooduleid, Modularbanki tuleb juurde luua kaks uut moodulit renditellimuste ja varade jaoks ning lisaks on vajalik liidestuda mitmete spetsialiseerunud teenusepakkujatega (isikusamasuse kontroll, kindlustus jne.) ning arendada renditellimuste kasutajarakendus. Koostatakse Modularbanki renditellimuste platvormi komponentdiagramm ja kahe uue mooduli olemi-suhte diagrammid.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 53 leheküljel, 8 peatükki, 23 joonist (neist 9 lisades), 6 tabelit (neist 3 lisades).

List of Abbreviations and Terms

AFS	Automobile Financing Services, alias for company providing car subscription service
AML	Anti-Money Laundering: legislation and practices concerned with preventing criminals disguising proceeds from illegal activities as legitimate income
As-is	A description of the present state
BABOK	Business Analysis Body of Knowledge
BO	Back-office, refers to staff and their tools responsible for providing a service
BO UI	Back-office user interface, i.e. staff portal
CS	Customer service
EA	Enterprise Architecture: analysis, design, planning and implementation of IT capabilities for business success
FinTech	Financial Technology: software and other technology used for the delivery of innovative financial services
LCM	Life cycle management
MVP	Minimum viable product: an early version of the product that is limited in terms of features, but attractive enough to win paying customers
O-BIM	Overall business information model
OEM	Original Equipment Manufacturer, e.g. car producer
SaaS	Software as a Service: access to software is licensing based on subscription and the software is centrally hosted
TOGAF	The Open Group Architecture Framework
UI	User Interface
VIN	Vehicle Identification Number: globally recognised unique vehicle identifier

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1 Introduction

The subscription business model is based on an arrangement where a customer makes a regular payment to access a product or service. One of the earliest examples to mention is ordering periodicals. The benefits of subscription for the provider include recurring revenue and customer lock-in, and for the customer the convenience of avoiding repetitive purchases. The rise of internet-based sales and service provision across industries has led to the growth in the number of companies relying on the subscription business model. Widely known global examples include the streaming platforms by Netflix Inc. and Spotify AB, Software as a Service (SaaS) plans from Microsoft Corporation (Microsoft 365), Adobe Inc. (Adobe Creative Cloud) and a vast number of other companies. There are also companies providing physical products via subscription, for which ordering is usually carried out online. Estonian examples for monthly subscription boxes include Kehrwieder Laegas chocolate and coffee case, dental hygiene products by Münt Healthcare, and weekly flower bouquet delivery by Studio Nelk.

In line with the growing popularity of the subscription business model, there are software providers for subscription order management and billing active in the international market. However, many of these are better suited for serving certain subscription business models than others, as there are crucial differences in requirements between fixed or usage-based pricing, gaining access to digital or physical resources, the level of personalisation of customer relationships etc. Furthermore, the increasingly digitalised economy is changing at an extremely high pace, endeavouring to keep up with shifting consumer behaviour and new opportunities afforded by technological advancements.

The subject matter studied in this thesis is topical for two companies: a primarily financial services software platform developer Modular Technologies OÜ and an automotive original equipment manufacturer (OEM) Automobile Financial Services (AFS). The first would like to develop a subscription business serving module for its Modularbank platform, the latter to enter car subscription service provision market.

The aim of this thesis is to design a software solution as part of the existing Modularbank platform to support the provision of car subscription as a digital service.

The thesis provides answers to the following questions:

1. What requirements should the subscription platform support for the minimum viable product (MVP) scope of digital car subscription service provision to retail customers?

2. What changes are needed to the design of the Modularbank platform to support car subscription service provision?

In order to answer the above questions, first of all the prevailing trends in the financial services software and car subscription markets are researched. Against the background of industry trends, the strategic motivations of Modular Technologies OÜ and AFS are examined.

Working out subscription platform requirements starts from the business description and drawing up the value stream of subscription service. These form the basis for drafting user requirements and analysing functional requirements. The analysis of requirements is structured according to capability areas necessary for the wider digital subscription service origination and provision capability. Business process analysis is used as a supporting method for developing a better understanding of the processes carried out in the main value stages. The chapter is concluded by drafting business rules and the overall business information model.

Next an overview is provided of Modularbank platform's existing architecture and technologies used. This sets the background for analysing how to fulfil subscription service requirements with Modularbank platform: what necessary functionalities are offered by existing components and which new components and external integrations are needed. Based on the results of gap analysis, a component diagram is compiled for the subscription platform and entity-relationship diagrams are drafted for the new Modularbank platform modules.

2 Research Aims and Methodology

This chapter starts out by introducing the business case that determined the topicality of this thesis and the role of the author. Next the research aims and delimitations are presented. Finally, an overview is given of the methodology employed.

2.1 Business Case and the Role of the Author

In 2020 Modular Technologies OÜ and the financial services subsidiary of an automotive OEM with global coverage (hereinafter referred to under the alias Automotive Financial Services, AFS) started discussions on potential cooperation. AFS was interested in entering the car subscription market and was looking for a software provider to support this business. AFS envisioned car subscription as an entirely digital business, excluding the actions directly involving the vehicles (drop-off, pick-up, maintenance etc.). Quickly growing start-up Modular Technologies with its flexible financial services platform Modularbank considered this business opportunity lucrative.

The author works as an analyst and project manager at Modular Technologies. She led the early analysis conducted for the subscription module development in Modular Technologies: researched the subscription industry and car subscription market, directly communicated with AFS to understand the business setting and requirements, analysed the high-level requirements provided by AFS in writing, drafted a high-level logical architecture model for the Modularbank modules involved in the provision of the subscription service and the necessary integrations, and modelled the subscription contract origination process.

Currently AFS is reviewing its wider business strategy. During this process further negotiations on the partnership in subscription module development have been halted. When discussions proceed, work will continue on exploring and analysing updated and refined requirements of AFS and actual development.

The real name of AFS is not revealed in this thesis for two reasons: first, it is unnecessary, as the subscription platform is designed as part of the Modularbank product and not a custom development for this one client only; and second, entering the car subscription market as a business development decision has not been finalised by AFS and its consideration is confidential.

2.2 Research Aims

The goal for this thesis was to analyse and design necessary changes and additions for the Modularbank platform, so that it could function as a subscription platform and support digital car subscription service provision to retail customers in an MVP scope. This scope consists of car subscription contract origination, managing a limited extent of contract life cycle events (adding and removing extra services from the contract, extending and prematurely terminating the contract), and billing for provided services. The subscription platform was designed to serve a wider customer base than a single provider.

Before starting the actual design, a multi-step analysis process was carried out in order to understand the business this software would be serving:

- Examination of the current strategic setting in the financial technology market with a focus on API-based platforms and the OEM captive market.
- Investigation of the motivations of Modularbank and AFS in entering the subscription market as a software provider and service provider, respectively.
- Analysis of the subscription service business: the value stream, the key capabilities needed to deliver the service, the main business concepts and their relationships.
- Elaboration of the requirements for the subscription platform, based on the initial list of requirements provided by AFS, validated and extended by desk research on existing subscription service providers, starting out from user requirements and then specifying the more detailed functional requirements.

Having developed a sufficient overview of the requirements that the subscription platform has to provide for and based on the overview of the existing Modularbank architecture, analysis was conducted on the gaps between Modularbank existing architecture and the target architecture, which would support car subscription service provision.

As part of solution design, a component diagram for the subscription platform including Modularbank's relevant existing modules, new modules developed for supporting subscription service provision, and required integrations was drawn up. Secondly, entity relationship diagrams were drafted for the new modules.

2.3 Delimitation of Thesis Scope

There are several limitations to the scope of this thesis. Firstly, the design of the software solution is based on the existing Modularbank platform, which will be extended to support subscription service provision. Secondly, the requirements for the software are largely based on initial input from one company - AFS, but also verified and elaborated by desk research of websites of existing subscription service providers.

Thirdly, the designed software solution is also limited in terms of features. The intention is for the designed subscription platform to enable AFS to roll out an MVP scope of subscription service: customers can filter vehicles and subscription packages, apply for a subscription contract and sign it, schedule vehicle pick-up and later drop-off, order extra services, and receive invoices for provided services. The MVP phase focuses on private individuals as customers, cars as the subscription objects, and offering a limited number of extra services and types of contract changes.

Fourth, the results of this thesis form the basis for continuing cooperation negotiations between Modular Technologies and AFS. Therefore, this is work is centred on the analysis and description of functional requirements and drafting the target architecture for the subscription platform. Once the decision has been made between Modular Technologies and AFS to enter into agreement for subscription software provision, the exact requirements of AFS would jointly be reviewed to ensure mutual understanding and make sure that any changes in requirements during the months that have passed would be taken into consideration before starting development. This would also be the time to discuss non-functional requirements of AFS. In summary, analysis of non-functional requirements, user interface design prototyping, software development and testing are outside the scope of this thesis.

Fifth, risk and cost-benefit analysis are not carried out. Chapters 4.3 and 4.4 discuss alternative solutions that a company seeking software for subscription service provision

should consider, the criteria for their comparison, and present an overview of existing providers. However, it is only possible to conduct thorough comparison of alternatives by entering into direct contact with potential solution providers. It is not possible to verify whether any existing provider is able to meet all requirements and at what cost by researching publicly available information.

2.4 Methodology

The underlying methodology and framework for conducting the analysis is The Open Group Architecture Framework (TOGAF) Standard for Enterprise Architecture (EA). EA provides strategic context for developing digital capability necessary for competitiveness in a fast-changing business environment [1, p. 6]. Developing an understanding of strategic issues and enterprise goals of the company entering the car subscription service market, the value stream of the subscription service business, enterprise capabilities needed to deliver it and performing gap analysis follow the TOGAF Standard and are depicted in the ArchiMate modelling language for EA.

The second approach used for structuring the analysis is Busby's modified V-diagram (Figure 1: Modified V-diagram for mapping business issues to requirements [2]. In order to provide a suitable design for the subscription platform, it is necessary to gather a thorough understanding of the problem the platform would solve and detailed requirements for development. This is done following the steps of the modified V-diagram, which maps business issues to requirements.

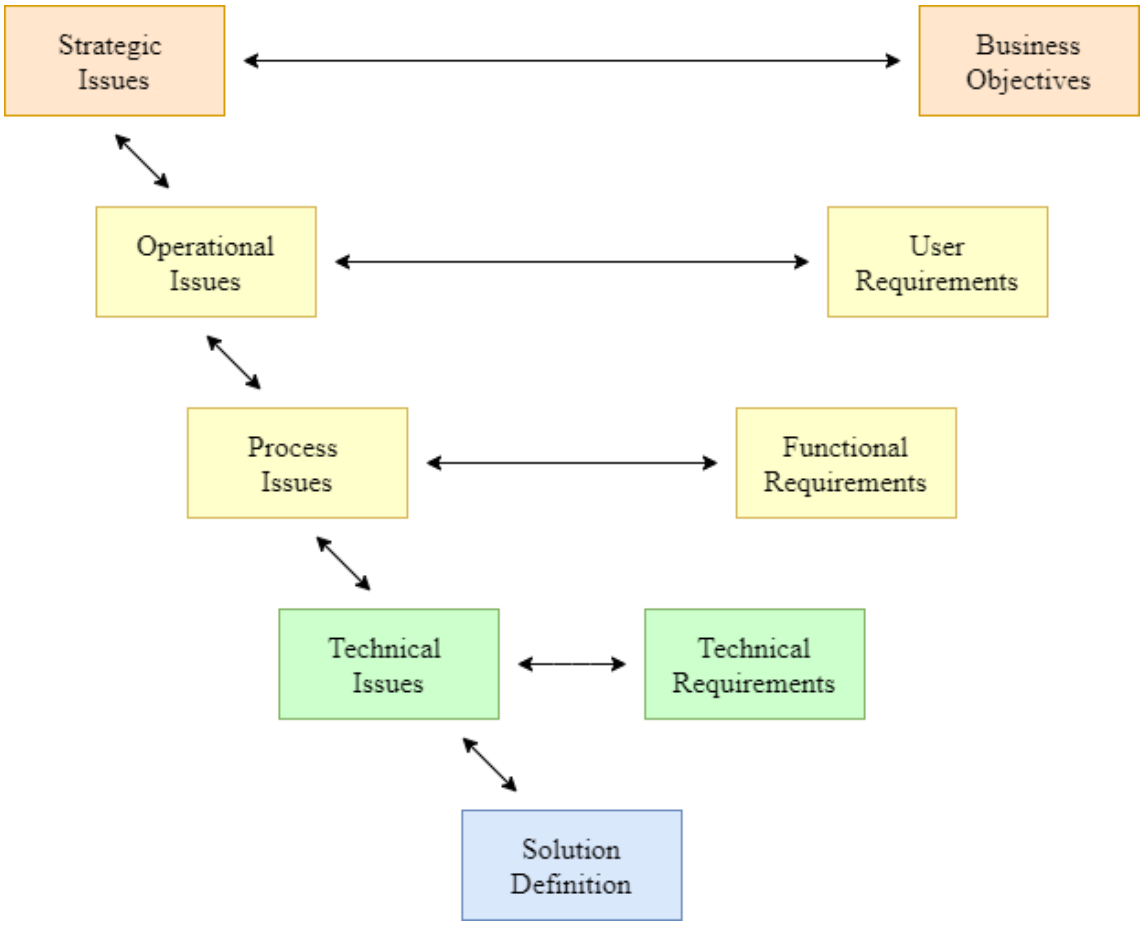

Figure 1: Modified V-diagram for mapping business issues to requirements [2]

The benefits of the modified V-model and the reasons for having chosen it as one of the tools for this thesis are the following:

- it works top-down, starting from a strategic understanding of the problem and drilling into more detailed level as analysis work proceeds, and
- it emphasises a two-way relationship between business issues addressed and requirements documented.

However, a part of the modified V-diagram is omitted from the research steps taken in this thesis: technical issues and technical requirements. This is because non-functional requirements are excluded from the scope this thesis due to reasons outlined in section 2.4.4 of this chapter.

2.4.1 Strategic Issues: Lean Canvas and Goals View

As this thesis is business-focused with the intention of contributing to the competitiveness of a specific technology provider Modular Technologies OÜ, providing an understanding of the sectors it operates in (banking, financial services) and plans to enter with the new module (car subscription) are of central importance. A range of recent sources are used for this reason, mainly drawing on research conducted by global leading consultancy companies.

Modular Technologies can be described as a start-up: it is a young company developing its own technology-based product, committed to building up a scalable business model and to ensuring that it has sufficient financing to keep growing fast. The framework chosen for analysing Modular Technologies as a company is Lean Canvas by Ash Maurya [3]. Lean Canvas takes a concentrated, "less is more" approach to encompass the focus areas of start-ups: what is the problem the company aims to solve and how, what gives the company unfair advantage over competitors, who are the customers and how to reach them, what metrics provide feedback to the company on whether it is effective, and what are the main revenue streams and cost areas. Maurya based the Lean Canvas on Alex Osterwalder's Business Model Canvas, but replaced some themes suitable for stable companies with others that have a better fit with the day-to-day pressures and risks start-ups face in establishing themselves in the market: Key partners was replaced with Problem, Key activities with Solution, Key resources with Key metrics, and Customer relationships with Unfair advantage [4]. The most important theme on the Lean Canvas, situated in the top left corner, is Problem (see Figure 3). This emphasises that the success of every start-up depends on understanding the business domain, so that the company sets out to sell what the market needs, not what the start-up is best fit to offer.

The business domain Modular Technologies targets with the new module is subscription. The strategic and motivational aspects of AFS entering the car subscription market are analysed using the Goals View of ArchiMate notation [5, pp. 5-6]. The Goals View is particularly useful for showing what is driving change and what business capabilities are needed to achieve it. Another strength of the Goals View is that it brings stakeholders interested in making the change a success and the goals set and outcomes sought into the same perspective.

Business capability is a term used throughout this thesis in the common-sensical meaning assigned to it by The Open Group, "A business capability is a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome" [6, p. 2]. In the Goals View the business capabilities are depicted on very high-level basis. Digital subscription service origination and provision capability forms part of Digital platform development capability. In chapter 5.3 the Digital subscription service origination and provision capability is further broken down to nine sub-capabilities (see Figure 6), as a tool for categorising the long list of user requirements.

2.4.2 Business Objectives: Business Description and Value Stream

The analysis of the subscription business and its key drivers and focal points is continued based on business description and by drafting the value stream model.

The business description is based on input received in direct communication with AFS - the list of initial requirements, which formed the basis for discussions in meetings. This was supplemented by desk research on existing vehicle subscription services in the market (see section 2.4.4 for more details).

According to The Open Group, value is fundamental to everything an organisation does [7, p. 1]. The value stream mapping technique was chosen as an analysis method for this thesis because it takes a customer-centric approach, focusing on what activities and outcomes deliver most value to the key stakeholders, and thus providing a framework for more effective business requirements analysis [7, pp. 3-4]. In the drafted subscription service value stream the subscriber is the key stakeholder. The model outlines four key value stages and the value created in each of the stages from the perspective of the subscriber. Later on in the thesis, work continues on analysing parts of the value stream, when capabilities necessary for subscription service delivery are mapped to the value stream and the business processes of the main value stages are modelled.

2.4.3 User Requirements

Somerville distinguishes between user requirements and system requirements, which he further categorises as functional and non-functional requirements [9, pp. 83-84]. User requirements describe what services the system is expected to provide to users and any significant constraints for its operation, whereas system requirements are more detailed

descriptions of the software system's functions, services and operational constraints [ibid.]. This thesis starts analysis of requirements from the point of view of users, as the subscription service is oriented to retail customers and the market is already competitive in some countries (see chapter 3.3 Car Subscription Market for an overview), thus the user flow in the subscription origination process and later during the subscription relationship with the service provider must be straightforward, smooth, pleasant, and adequate.

User requirements are analysed based on three main types of actors – subscriber and subscription service provider's front-office and back-office staff (CS staff and BO staff, respectively) – and are categorised into nine capability areas needed for digital subscription service origination and provision. Textual lists of user requirements are provided in tables in Appendix 3. In order to provide an overview, over 30 summarised use cases are depicted in four use case diagrams, grouped together by capability areas. The use case related to the most important value stage of subscription service – subscription contract origination process – is analysed in more depth than other use cases, depicted as the main and over a dozen included use cases. Use case diagrams were chosen as an analysis method as they are helpful in clarifying scope and providing a high-level understanding of user requirements [10, p. 358]. As for the purposes of this thesis use case diagrams were chosen only to provide an overview and are not thoroughly analysed, it should be kept in mind that the general limitations of use case diagrams as highlighted by Business Analysis Body of Knowledge (BABOK) [10, p. 359] are especially notable here: decisions, business rules, and non-functional requirements related to the use cases are not depicted in the diagrams. It should also be noted that in this thesis use case diagrams focus on three natural person actors and do not include the system as an actor. Functions performed by the system are analysed as part of functional requirements.

2.4.4 Functional and Non-Functional Requirements

User requirements serve as input for analysing functional requirements. According to BABOK, functional requirements describe the capabilities that the information system must have in terms of the behaviour and information that the system will manage, whereas non-functional requirements describe the qualities that the system must have and conditions under which it must remain effective [10, p. 16]. Thus non-functional requirements are concerned with measurable qualities that define how well the functional

requirements must perform, including availability, performance efficiency, reliability, scalability, security etc. [p. 302-303].

Two types of sources were used for determining the functional requirements for the subscription module. First, AFS supplied Modular Technologies with an initial draft of their requirements in writing and these were later discussed in meetings. This document served as a starting point for requirements discovery and is not presented in this thesis in its original format, as it was provided to Modular Technologies in confidence and includes direct references to AFS.

Secondly, market research in the form of desk research was carried out to gain a broader understanding of the market [11]. The websites of existing subscription service providers were studied for comparison and validation of the requirements provided by AFS, and also to take into account the approaches to subscription service provision adopted by competitors. The competitors reviewed include Access by BMW [12], Care by Volvo [13], Carly [14], Cluno [15], Fair [16], and Pivotal Subscription by Jaguar and Land Rover [17]. While drafting the requirements for the Modularbank subscription module it was kept in mind that it would not serve as custom-built software, but a platform to be used by many subscription service providers.

Next, functional requirements are worked out for each of the nine capability areas. Functional requirements are presented as a list. This format was chosen for clarity and convenience in further use, because a list of detailed requirements would be convenient to use as part of or appendix to a contract between subscription software provider and subscription service provider.

High-level business process models in the BPMN modelling notation are drafted to support textual description of the functional requirements for the most important processes: the processes carried out in the value stages of the subscription service value stream (subscription contract origination, extra service requesting and contract life cycle events management, and regular invoice creation, see Appendix 5).

Non-functional requirements for the subscription platform are not analysed in-depth in this thesis. The first reason for this is that the service provision negotiations between Modular Technologies and AFS have not reached the discussion of service delivery terms and standards. As a software provider to financial services providers, including payment

services of banks, Modularbank has proven able to cater for critical services. In general subscription service can be categorised as a non-critical service and weighing service provision levels against cost, subscription service provider is likely to forgo the highest service levels (for example, 99.9% availability).

2.4.5 Business Rules and Business Information

Based on business description, the key concepts of subscription service provision are examined through the formulation of business rules and compilation of the overall business information model (O-BIM), which visualises the relationships between the key concepts. At this early stage of research, O-BIM is used to map out the key persons, objects, events, and how they are related to each other in the context of the car subscription service. Drafting O-BIM serves as means to define general business information requirements to IT [17] and will later on act as one basis for designing the physical data models for new modules of the Modularbank platform.

2.4.6 Subscription Platform Design

Having established a multifaceted understanding of subscription service and requirements to the software that supports its delivery, as the next step in analysis an overview is provided of the Modularbank platform as-is. Existing modules are listed. Figures depicting the platform's logical architecture and deployment diagram as drafted by Modular Technologies are presented in appendices 6 and 7.

Next, gap analysis is carried out to study and compare existing and target architecture: identify which existing Modularbank components can be put to use for the subscription platform and which need modifications, which new modules should be added to Modularbank to start supporting subscription service provision, and for which required functionalities it would be practical to integrate with existing specialised software systems. The results of gap analysis are presented in a table grouped by requirement category, and for a comparative overview also in a matrix table format proposed in TOGAF Standard 9.2 [1, pp. 236-237] (see Appendix 8).

A component diagram is put together for the new subscription platform, depicting existing and necessary new Modularbank modules and integrations with external solutions. Finally, entity relationship diagrams are drafted for new Modularbank modules.

3 Overview of the Domains

Like many other sectors, the financial services industry is experiencing tremendous change. Advances in technology have enabled an abundance of new products and services to be brought to market, raising consumer expectations for convenience and flexibility at low cost. Digitalisation is at the core of changes. While these trends are fuelling the growth of newcomers, they are putting high pressure on incumbent financial institutions to survive in the redefined market. The financial sector is disrupted, and not only due to technology but also because of persistently low interest rates. Now companies in other sectors too are seeking entry to specific niches of the financial sector with the aim of putting their resources to better yielding uses. There is need for novel financial technology solutions from both existing as well as new financial institutions and also other companies interested entering some specific financial services niche.

3.1 Incumbent Banks

One hindrance that keeps back successful transformation of incumbent banks is their legacy IT architecture. In 2019 McKinsey surveyed international banks and found that 70% were reviewing their core banking platforms due to high cost, slow time to market with new products, inability to offer personalisation due to product-aligned systems, and poor connectivity with innovation-enabling ecosystems [18]. Thus banks recognise the need to change in order to maintain competitiveness, but also the difficulties in achieving this due to their current technological setup. This is forcing banks to open themselves to novel solutions. In its research "Platform Banking and Digital Ecosystems" focused on the German and Dutch markets, PwC found that the majority of incumbent banks are investigating opportunities to set up partnerships with FinTech providers [19].

The main driver for seeking partnerships with FinTechs is the need to improve bank product offering, including to start to provide services beyond the scope of traditional banking [19]. Different forms of partnerships can be witnessed, but both studies found most potential in banks starting cooperation with innovative cloud-native core banking platforms, especially those offering API-integration [18] [19]. Operating in a quickly

changing environment with significant regulatory burdens, banks able to implement external integrations fast gain a competitive advantage. McKinsey even proposes that out of 19 services in the five main bank business domains (customer management, payments, risk management, channel and ecosystem), only 2 should remain custom-built by bank (see Figure 2) [18]. These are the most customer facing ones and pivotal in conveying the bank's identity to customers: mobile app and desktop app in the Channel domain. All other services can be built relying on external providers. The role of API's for banks is described as an accelerant in getting innovations to the market fast by Accenture [20].

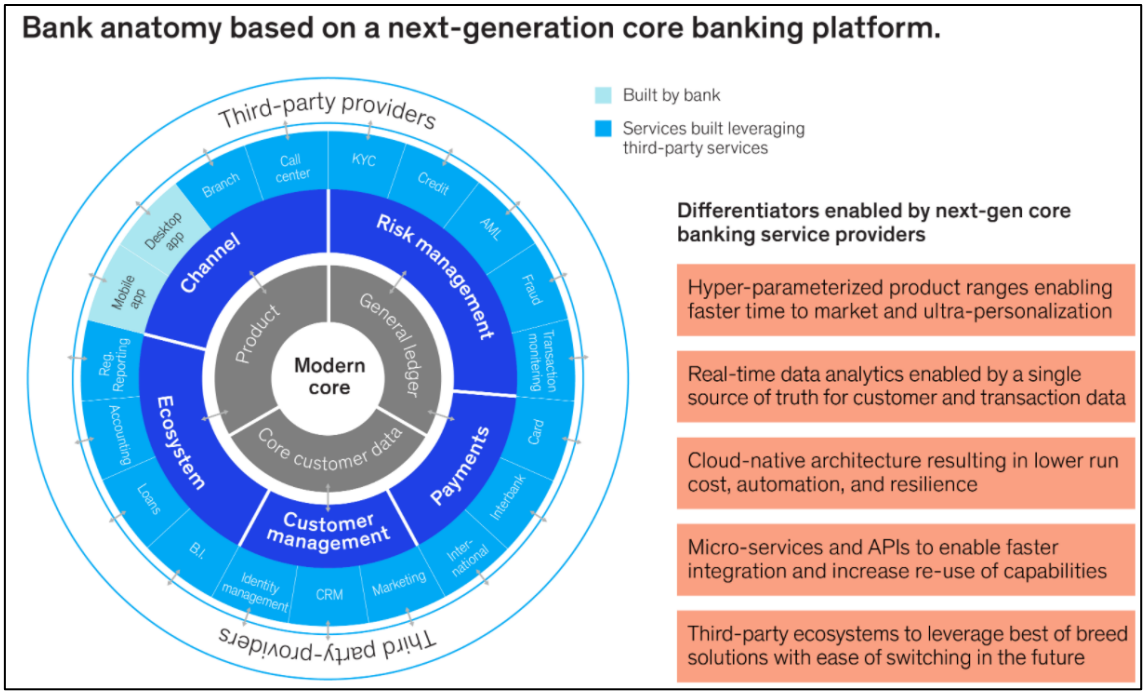

Figure 2: Bank anatomy based on next-generation core banking platform. Differentiators (sources of competitive advantage) enabled by next-gen core banking service providers [18]

3.2 Non-Banks and Embedded Finance

Another trend influencing the FinTech market is companies active in technology or in traditional industries vertically integrating into financial services. By embedding finance into the portfolio of services provided, a company can offer more value to its customers and lock customers in long-term relationships and at the same time open up new revenue streams. A great number of non-banks have already taken this course: global examples include global technology leaders, e-commerce, ridesharing, telecom etc. companies

offering digital wallets and various payment and lending services [21]. An Estonian example is Telia Eesti AS acting as a creditor authorized by the Estonian FSA (Finantsinspektsioon) [22]. As the core business of these companies is outside finance, many turn to FinTechs offering the complex finance infrastructure that can be integrated fast [21].

For the automotive industry, expanding into financial services is nothing new. Most global carmakers have captive finance subsidiaries that provide loans and leasing to customers, helping to increase sales of cars (Ford Credit, Daimler Mobility, BMW Financial Services, Volkswagen Financial Services, Toyota Financial Services, etc). Now this stable industry is being disrupted. The forces transforming automotive captive finance include digitalised finance and the so-called future of mobility, which is service-oriented, consumer-centric, and connected [23]. Deloitte recommends traditional companies in this sector to invest heavily in digital platforms to win and retain customers by offering new services in finance, mobility and in-car transactions and systems-related data [23].

Focusing on vehicle leasing providers, Roland Berger studied the medium-term effects of changes in mobility and consumer choice, and noted that the biggest influence is the prominence of usership over ownership, facilitated by subscription-based business models in various industries [24]. In the same report it was suggested that “Car-as-a-Service" or CaaS could be used as the term to describe a longer term but flexible, service-oriented subscription-based mobility solution, in the provision of which digitisation and connectivity play a central role [24].

3.3 Car Subscription Market

Based on their research of the global car subscription market, Prescient & Strategic Intelligence forecasts significant growth for this sector for 2020-2030 [25]. The trends driving the growth are decreasing global car sale, changing ownership patters especially among youth, and technological transition [ibid. onwards in this paragraph]. The subscription service providers can be categorized into original equipment manufacturers (OEMs) and non-affiliated companies offering subscription of several car brands. Prescient & Strategic Intelligence expects the market share of OEMs to grow at a higher pace in the next decade due to available inventory. Based on vehicle type, the car

subscription market can be segmented to economy, executive and premium. In the previous decade offering in the premium segment was notably plentiful, although quite limited in geographic reach (Book by Cadillac, Passport by Porsche, Flexperience by Mercedes-Benz, Access by BMW, CarpeDrive/Pivotal by Jaguar and Land Rover, Care by Volvo). For a hefty monthly bill, subscribers get an all-inclusive package of new car, vehicle delivery by concierge, maintenance, insurance, roadside assistance, and a possibility to switch cars every few months. While car sales are down, OEMs are likely to enter the subscription market with more affordable car types and subscription packages, catering to the needs of those customers interested in having sole use of a car without needing to make a sizable down-payment for it, but also to those that want to switch cars in favour of a newer one every half a year to a year at reasonable cost.

3.4 Car Connectivity

In a research report forecasting the future of OEM's until 2035, Deloitte divided the OEM revenue tree into five business segments: vehicle sales, aftersales, financial services, Mobility as a Service, and Car as a Platform [26] (see OEM revenue tree with streams in Appendix 2). Looking at the future of financial services, Deloitte expects OEMs to "focus more on service-based business and dominate the financial products and services market in the future mobility landscape by owning the payment infrastructure, offering full-service leases, and funding multibrand vehicles" (ibid. p.67 and onwards in this paragraph). The latter, somewhat unexpected, is due to the rising trend of Mobility as a Service, which is based on the growing preference of usership over ownership and satisfying differing customer needs. Mobility as a Service is strongly related to connectivity. Connectivity facilitates increased convenience in predictable vehicle maintenance, navigation, passenger pooling, connecting users with parking spaces etc. (p.75). What constitutes additional convenience to drivers and users, means business to OEMs: "the main role of connectivity is to act as an enabler for other revenue streams or as a cost optimizer" (p. 98). Majority of Car as a Platform revenues are expected to derive from connected services sales, more precisely highly customized individual services and infotainment afforded by autonomous driving advancements (p. 93). In summary, the revenue streams of OEMs are significantly affected by digitalization, increasing connectivity and ability to expand provided financial services, especially payment related.

4 Overview of the Companies and Alternative Solutions

In the first half of this chapter an overview is established of the motivations of the two companies that are in the focus of this thesis: Modular Technologies and AFS. In the second half, a high-level analysis is carried out on the alternatives for subscription software sourcing and the results of desk research on existing providers are presented.

4.1 Modular Technologies OÜ

Modular Technologies OÜ was founded in 2019 by a team of experienced IT professionals with a background in the financial sector. In two years the company has validated the market and grown into a team of about 50 based in two countries. The key components of Modular Technologies' business plan are summarised on the Lean Canvas in Figure 3.

The core offering of Modular Technologies is the modular financial services software platform Modularbank. The main modules so far launched include the banking core, payments, lending, deposits, card issuing, and financial accounting, supported by several other modules and a workflow engine. The platform is API-first for fast integration with external systems.

This technology enables Modular Technologies to target three segments of the financial services market. The segments are quite different from each other, but suffer from similar problems which Modularbank is well-placed to solve. Incumbent banks, non-banks introducing financial services (for example, telecoms and marketplace providers), and established financial institutions and newcomers (for example, payday loan providers) all want to introduce new services to the market fast, as fully digital services that are business-driven. As an alternative, custom development is slow and existing legacy systems may not accommodate the desired level of product configuration. This is where Modularbank comes in, guided by the following value proposition:

> *The modular platform for seamless banking. Transform your bank or offer new financial services within weeks.* [27]

Due to Modularbank's modular structure and API-first design, it is possible for customers to quickly integrate with just a selection of its modules. In order to get started, develop the core offering and attain the first references, Modular Technologies is keen to onboard both on-premise as well as SaaS (Software as a Service) customers. There are agreements in place with the first group to share initial development costs and as a strategy to win over the market pay-as-you-grow pricing model is offered to SaaS customers.

Importantly, both groups present additional sale opportunities for further modules. What allows Modularbank to strengthen its competitive position is partnering with related services providers, such as AML (anti-money laundering) and identity verification, to build a comprehensive ecosystem, rendering excellent cross-sales opportunities.

<table>
<tr><td>Problem

- Long time to market
- Resources under-utilised
- End-customers seek fully digital, one-stop-shop services</td><td>Solution

- Modular cloud-based platform
- Simple and fast integration
- Rapid implementation
- Well-connected ecosystem
- Pay-as-you-grow SaaS offering</td><td>Unique Value Proposition
“The modular platform for seamless banking. Transform your bank or offer new financial services within weeks.”</td><td>Unfair Advantage
- Formative role in industry-leading ecosystem
- Modular platform, flexible
- Extensive experience in transformative financial IT</td><td>Customer Segments
- Incumbent banks
- Non-banks introducing financial services
- Established financial institutions and newcomers</td></tr>
<tr><td>Existing Alternatives
- Custom development
- Existing service providers
- Lower return from resources
- Customers bridge the gaps between services/ industries by themselves</td><td>Key Metrics

- Customers onboarded per segment, per market
- Customer churn
- Annual recurring revenue (ARR) per segment, per customer, per market</td><td>High-Level Concept
API-first next-generation financial services suite</td><td>Channels

- Sales teams in Berlin and London
- Partnership network (tech providers, integrators, consultants)
- Sales support by marketing and communications team</td><td>Early Adopters
- Share development costs
- Cover different segments
- Grow and expand services offered
- Reputable</td></tr>
<tr><td colspan="3">Cost Structure
- Staff
- Infrastructure</td><td colspan="2">Revenue Streams
- Early adopters (on-premise)
- Early adopters (SaaS)</td></tr>
</table>

Figure 3: Modular Technologies OÜ Lean Canvas (compiled by the author based on [27], [28])

4.2 Automobile Financing Services (AFS)

AFS is a captive finance company of a global automobile OEM. It offers a range of financial products and services to customers and car dealers. The company is now exploring business opportunities lying in the car subscription market, especially in the

United States. AFS is in initial discussions with Modular Technologies regarding the latter providing technology to support AFS setting up fully digital subscription service.

AFS has fallen behind several of its competitors, who have already launched subscription service. At the same it is noteworthy that the competitors are still running pilot programs and are scoping the market on a small scale, thus AFS can still catch up with them if it entered car subscription soon.

What is more, AFS has started to feel the pressures cited in research that cover trends faced by OEMs: car sales and leasing businesses are losing customers that prefer to avoid long-term financial commitments, yet are keen to pay for convenience and new technology. Belonging to an OEM group of companies, AFS is driven to maximise residual value of vehicles in its possession, including cars returned after leasing contracts have ended.

See the motivational and strategy elements for AFS's expansion to the vehicle subscription market in Figure 4. AFS seeks to replace shrinkage of the leasing market with new business in subscription. Provided AFS enters the subscription market with an excellent, smooth and seamless offering and on a large scale, it could take the dominating role in the market. In the goals view, the fully digital subscription service provision is modelled to form part of AFS's digital platform. It is of pivotal importance that AFS develops a digital platform that is fit to support expansion of offered digital services. Subscription service connectivity plays a growing part in OEM revenues and customers attaining usership of a car via a monthly subscription bill are a natural target for subscription of additional services related to driving.

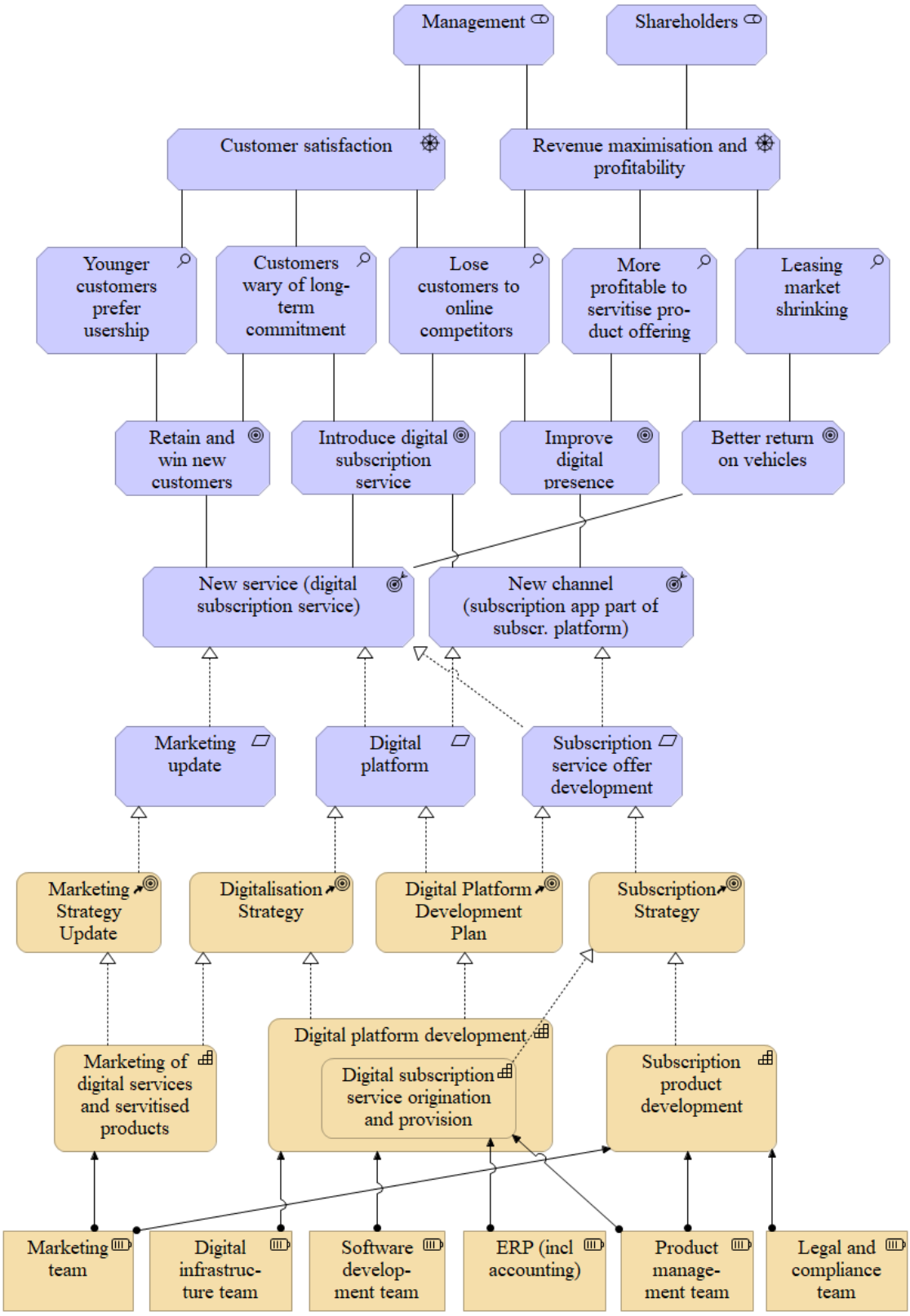

Figure 4: Goals view for AFS's expansion to subscription business (source: author)

4.3 Alternatives for Subscription Software Sourcing

Companies entering the digital car subscription service provision market can choose between three main alternatives for acquiring software to support the business:

1. Develop custom software, either in-house or by outsourcing.
2. Buy or rent (license, SaaS etc) an existing software solution available in the market.
3. Go for a middle-of-the-road option, partnering with a software provider catering to many third parties, but able to customise the solution to a significant extent.

The alternatives should be analysed in terms of:

a) cost,
b) time to market,
c) how well each enables meeting the company's specific requirements, especially in terms of making it possible to gain a position of competitive advantage in the market,
d) flexibility for the future: possibility to further customise the software after the MVP period, in case initial feedback from the market points out a need to make significant changes to how the service is delivered,
e) how well the software supports the wider development of the company, in case the enterprise is engaged in several lines of business or ambitious enough to enter new markets.

In terms of cost, an existing solution (option 2) can be expected to be the preferred choice, software partner (option 3) a medium option and custom software (option 1) can usually be expected to be the least favourable choice. Naturally, it should be kept in mind that cost analysis should include consideration of total cost of ownership, i.e. direct as well as indirect costs related to acquiring and maintaining the software.

In terms of time to market, again the existing solution (option 2) offers the best outcome, while starting custom software development (option 1) would be the slowest route, provided that partnering with a software provider (option 3) would help gain some head start.

The third criterium for comparing the alternatives – how well the software meets specific requirements – is the most important for a company that is well-funded and wants to gain a dominant position in the market fast. From this perspective, custom development (option 1) is the best, most flexible alternative, partnering (option 3) the second best, and going for an existing provider (option 2) the least advantageous one. At the same time, given that the latter option scored the best in terms of cost and time to market, it is worthwhile for the company to conduct market research for existing solutions already available in the market and thoroughly analyse how well these meet the initial requirements and on what terms.

The analysis should also consider how well the existing providers would be able to cater for changing business needs (criterium d). Custom development (option 1) can be expected to provide far more flexibility for supporting changes in business processes and a software partner (option 3) is also likely to be better able to support business changes than an existing solution (option 2).

The final criterium (e) depends on the wider business set-up and strategy of the company entering the digital subscription provision market. In case the company is a start-up with a narrow focus on only the car subscription business, then this wider perspective may not play any role at all. It may even consider it a disadvantage if its software provider (options 2 and 3) divided its focus between different lines of business. But if the company was interested in offering financial services as well as car subscription, which was described as a trend in the domain overview chapter, then a platform supporting both of these business lines would be a very advantageous choice. See high-level comparative overview of the alternatives in Table 1.

Table 1: High-level comparison of subscription software acquiring alternatives (source: author)

	Custom dev.	**Existing solution**	**Software partner**
Cost	3	1	2
Time	3	1	2
Requirements	1	3	2
Changing needs	1	3	2
Wider strategy	2	3	1
Total (least is best)	**10**	**11**	**9**

4.4 Overview of Existing Providers and Modularbank Amongst Them

In practice there are many subscription software providers in the market (Zuora [29], Chargebee [30], Recurly [31], Younium [32] etc) and also a few that focus on cars (Clutch [33], Vulog [34]).

Carrying out desk research, it is difficult to estimate how well the existing subscription software providers can meet specific requirements. Due to their Business-to-Business sales models, a subscription service provider would need to get into direct contact with the software providers to find answers to more in-depth questions. Some of the leading subscription software providers have built diverse platforms, for example, the front page of Zuora's website promises that subscription service providers can "manage quotes, orders, billing, and revenue recognition for the entire customer lifecycle on a single platform". Yet mobility is not mentioned as one of Zuora's key industries in its website. The same can be said for other major subscription platforms. In general, most existing subscription platforms have focused on serving customers in the SaaS and other digital content industries, and thus may not sufficiently support subscription business processes that have high-value assets like cars in the centre of their business. Hence the key question is how well they can meet the requirements of a car subscription provider.

Clutch claims to be the leading mobility platform for car dealerships, fleet managers and car rental companies in the United States and Canada, offering solutions for subscription, rental, fleet monitoring and vehicle delivery [33]. Vulog, headquartered in France, promotes itself as the leading technology provider for shared mobility solutions [34]. Its solutions focus on sharing cars, corporate fleet, and e-scooters etc., rental, subscription and fleet operations management.

In summary, it is clear that there are existing providers in the market, whose solutions should be carefully analysed before deciding which software alternative to go for.

Modular Technologies aims to become a software partner for digital car subscription service providers. Its strength in comparison to the above-mentioned existing providers is that Modularbank can also cater to financial services related requirements with its core banking, lending, cards and other modules. Hence Modular Technologies has a strong offering for companies active or expanding to financial services (criterium e). Also, it is well placed to customise the solution to specific requirements of a few partners. While

the existing providers may already be experienced in their core markets, their solutions may lack flexibility required by newcomers, as their technological choices were made based on different market needs and technologies available at the time.

5 Requirements for Digital Car Subscription Service

This chapter starts out by providing a description of how AFS' subscription business would be set up and drafting its value stream. Based on this the business glossary is complied.

Next, user requirements are drawn up in the nine capability areas of digital subscription service origination and provision and graphically summarised on high-level use case diagrams. Based on these, lists of functional requirements are elaborated. Finally, business rules and the O-BIM are drafted.

5.1 Business Description for AFS's Car Subscription Business

AFS is setting up car subscription business. The aim of the business is to offer retail customers flexible subscription packages that allow for various combinations of vehicles, contract duration, and extra services. As a minimum, all subscription packages include a vehicle, insurance, regular vehicle maintenance and roadside assistance. In order to simplify pricing, vehicles are categorised into classes representing their current value and there is a limited number of standard contract durations offered (6 months, 12 months etc.). The monthly price of the subscription package depends on the vehicle class, contract duration, and whether the package includes any extra services, such as possibility to swap cars and convenience services like concierge for vehicle pick-up and drop-off.

The subscription origination process and most other related customer communication and documentation is digital. Subscribers can access these services via mobile and desktop apps.

The contract origination process takes place in three stages: application, offer, and contract (see Appendix 5 for the business process model of subscription contract origination). In the app subscriber can filter and select vehicle and other components of the package for subscription. This can be done without registering. However, in order to submit an application, the subscriber has to register: enter personal data and verify

identity. Next, AFS carries out a credit assessment and if the subscriber passes this, then an offer is generated. If the subscriber does not pass the credit assessment, then the application is declined and the process stops. If the subscriber accepts the offer, then he/she must provide payment details and specify who will be the main driver and up to two additional drivers. Next a contract is generated for e-signing. After e-signing the contract subscriber can schedule vehicle pick-up time. As part of the vehicle handover, both parties sign an instrument of delivery and receipt.

Having signed the contract, the subscriber can filter for additional services and order these in the app, provided he/she has no overdue invoices. Also, subscriber can apply for more than one simultaneously valid subscription contract: for example, for spouse or partner.

In the app the subscriber can keep track of his/her application history, subscribed products and services, invoices, status of payments, receive notifications, and schedule maintenance appointments, and contact customer service.

Subscriber can request contract changes: premature termination of subscription contract after a certain minimum contract period, which involves a penalty charge, or an extension of contract, in which case a new contract is generated on the same terms and presented to the subscriber for e-signing.

As per contract terms, AFS staff can levy additional charges to the contract as extra services to cover costs related to vehicle poor condition after return, sending notices for overdue payments etc.

To summarise, the MVP scope is for software that supports the digital process of setting up a contractual customer relationship for the provision of car subscription service, managing certain contract life cycle events, and billing for provided services. See subscription service value stream in Figure 5.

The MVP functional requirement should be considered alongside key non-functional requirement of quality as perceived by the subscriber: it is in the interests of the subscription providing company to offer subscribers a smooth onboarding flow and sell add-on extra services, which help keep the customer relationship pleasant and “sticky”.

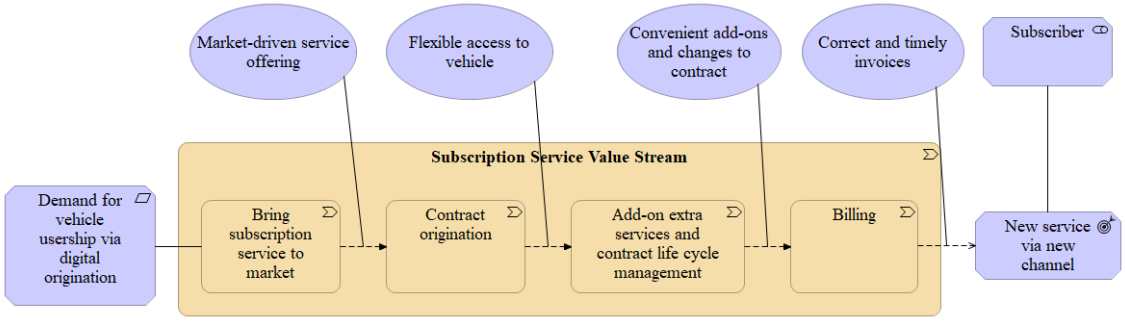

Figure 5: Subscription service value stream[1] (source: author)

5.2 Business Glossary

Application – Subscriber's request for subscription submitted in the subscription app.

Back-office UI – Subscription platform user interface for subscription service provider's staff.

Concierge – Subscription provider's staff member, who delivers vehicle to/from subscriber.

Concierge service - An extra service for vehicle pick-up and drop-off, included free of charge in some subscription packages and offered for a fee to other subscribers.

Contract – A legally binding agreement between subscription service provider and subscriber, which defines terms for service provision, and the rights and responsibilities of each party. Contract is drafted based on the offer made by the subscription provider to subscriber, after subscriber accepts the offer.

Contract change – Subscriber and subscription provider may agree to change certain terms of a valid subscription contract, for example, to extend or prematurely terminate the contract.

Contract duration – Pre-determined length of contract. There is a limited number of standard contract durations offered (6 months, 12 months etc.). In most cases contract may be extended by standard contract extension period (1 month, 3 months, 6 months etc.).

Credit assessment – Also credit analysis, risk assessment, risk scoring. A process whereby the creditworthiness of the subscriber is assessed by the subscription provider or a specialised service provider hired by the subscription provider. The process is carried

[1] See value stream diagram supplemented with serving capabilities in Appendix 4 (in bigger font)

out after the subscriber has submitted a subscription application and may result in either accepting or rejecting (declining) the application by the subscription provider.

Digital signing – Also e-signing. A legally binding signature in electronic format used for signing electronic documents.

Driver – Each subscription contract must include details of main driver and up to two additional drivers. Subscriber entering subscription contract need not be the main driver or additional driver.

Extra services – Various vehicle, subscription and maintenance related services. A selection of extra services may be included free of charge in some subscription packages and offered for a fee to other subscribers as per requests received via the subscription app during contract validity.

Instrument of delivery and receipt – A legal document signed between a staff member of the subscription provider and the subscriber, when a vehicle is physically handed over to/from the usership of the subscriber.

Insurance – Each subscription package includes vehicle insurance.

Invoice – Subscriber pays for subscription provider's services based on invoices issued by the subscription provider. There are regular monthly invoices and once-off invoices payable outside the monthly cycle for specific charges. Invoice specifies list of services delivered and the amount payable for each, any prepayments, overdue amounts and penalties if applicable, and the total amount payable.

Notification – Messages and alerts related to invoices, vehicle maintenance, marketing etc. sent by the subscription provider to subscriber in the subscription app and via e-mail.

Offer – Subscription service provider's proposal for subscription terms provided to the subscriber as a response to his/her application, in case the subscription provider decides to accept the application.

Subscriber – Individual, who is using subscription platform (excluding own staff).

Subscription – A product or service delivered from subscription provider to subscriber during a longer time period on terms that were agreed in advance, involving either an advance payment or regular payments throughout agreement validity, or both. In the context of vehicle subscription, invoices are issued and payable on monthly basis, except for certain once-off charges.

Subscription app – Subscriber-facing application for providing subscription service origination, subscription contract life-cycle management, billing and communication related services and support.

Subscription package – Subscription product, which consists of a vehicle class, contract duration, insurance for the vehicle, and optionally a selection of extra services.
Swap – Certain subscription packages include the right for subscriber to swap vehicles during contract validity period.
Vehicle – Means of transport. In MVP scope of subscription platform: a passenger car.
Vehicle class – Vehicle category. Vehicles are categorised into classes by the subscription provider according to vehicle approximate current value.

5.3 User Requirements

There are three main types of actors. First, subscribers, including potential subscribers. Second, two main user groups among AFS staff: back-office staff members (BO staff) and customer service staff members (CS staff). Some of the activities of staff member groups may overlap. The key differences are that BO staff is responsible for configuring products, services and prices in the system and for reporting and analysing business results, whereas CS staff has more directly customer-facing responsibilities.

The requirements for the subscription platform are categorised into nine capability areas of AFS' digital subscription service origination and provision capability (see Figure 6).

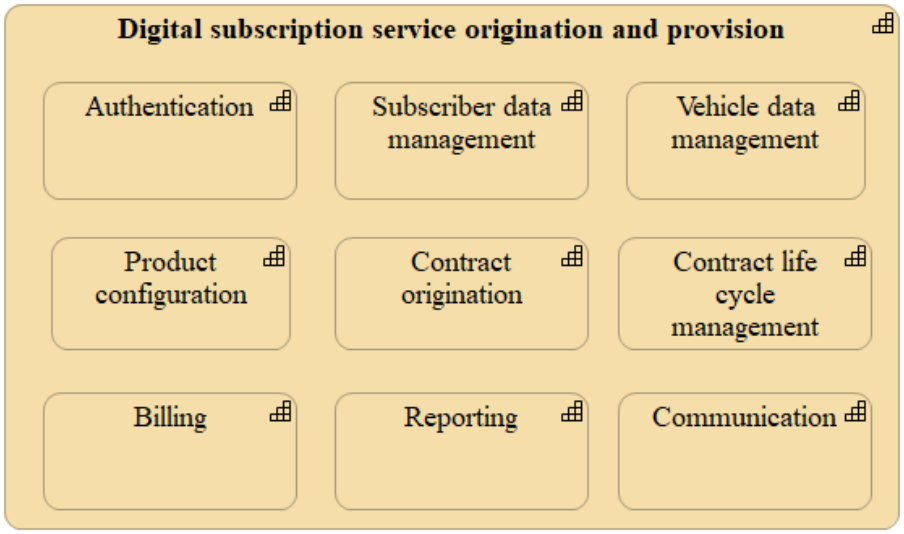

Figure 6: Subscription platform capabilities required for subscription service origination and provision (source: author)

See subscription service value stream supplemented with serving capabilities in Appendix 4.

The user requirements are summarised into a graphic overview in use case diagrams, grouped by capability areas (see Figures 7, 8, 9 and 10). Please see more detailed lists of user requirements by actor and capability area in Appendix 3.

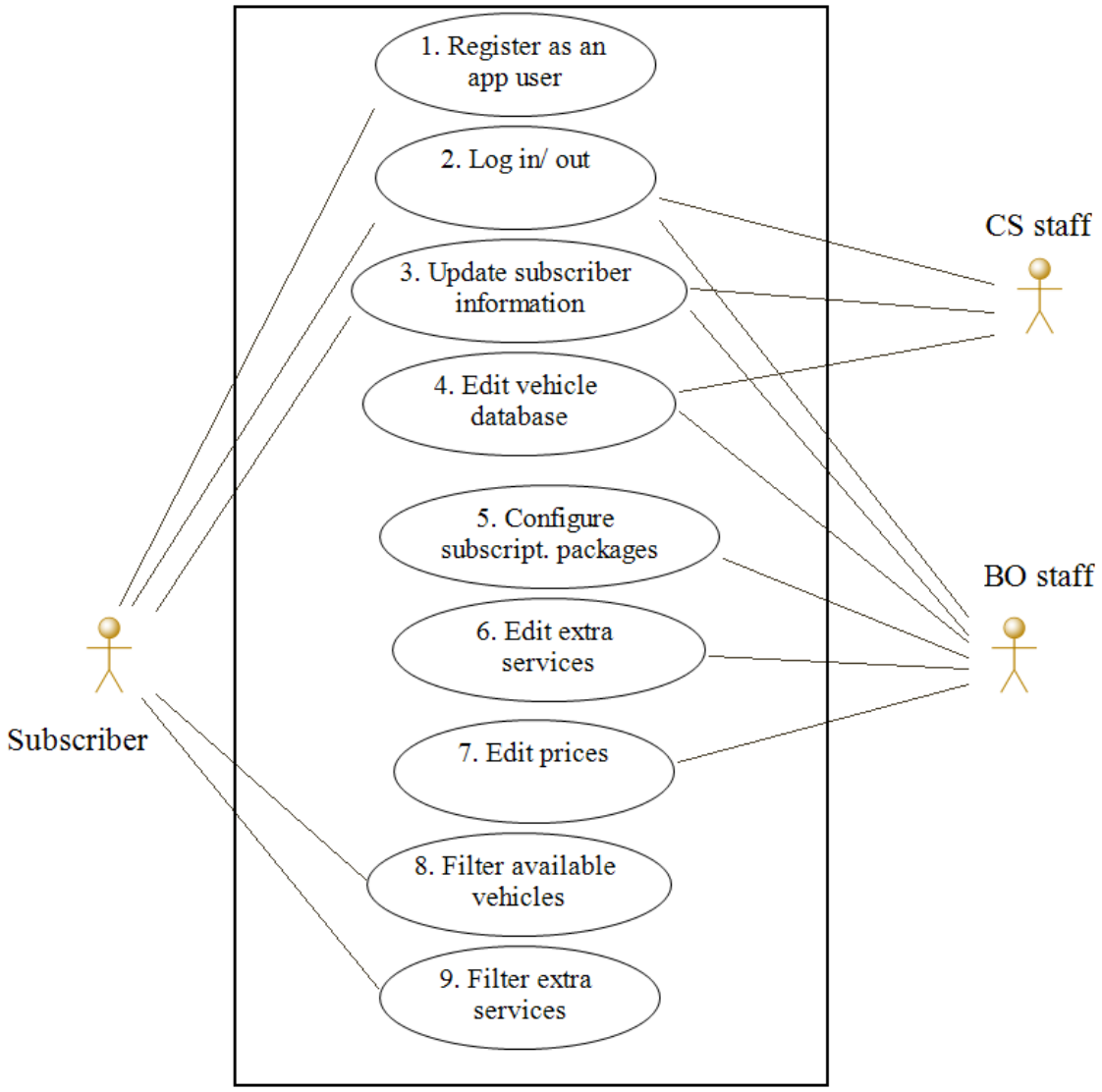

Figure 7: Main use cases for authentication, subscriber and vehicle data management, and product configuration (source: author)

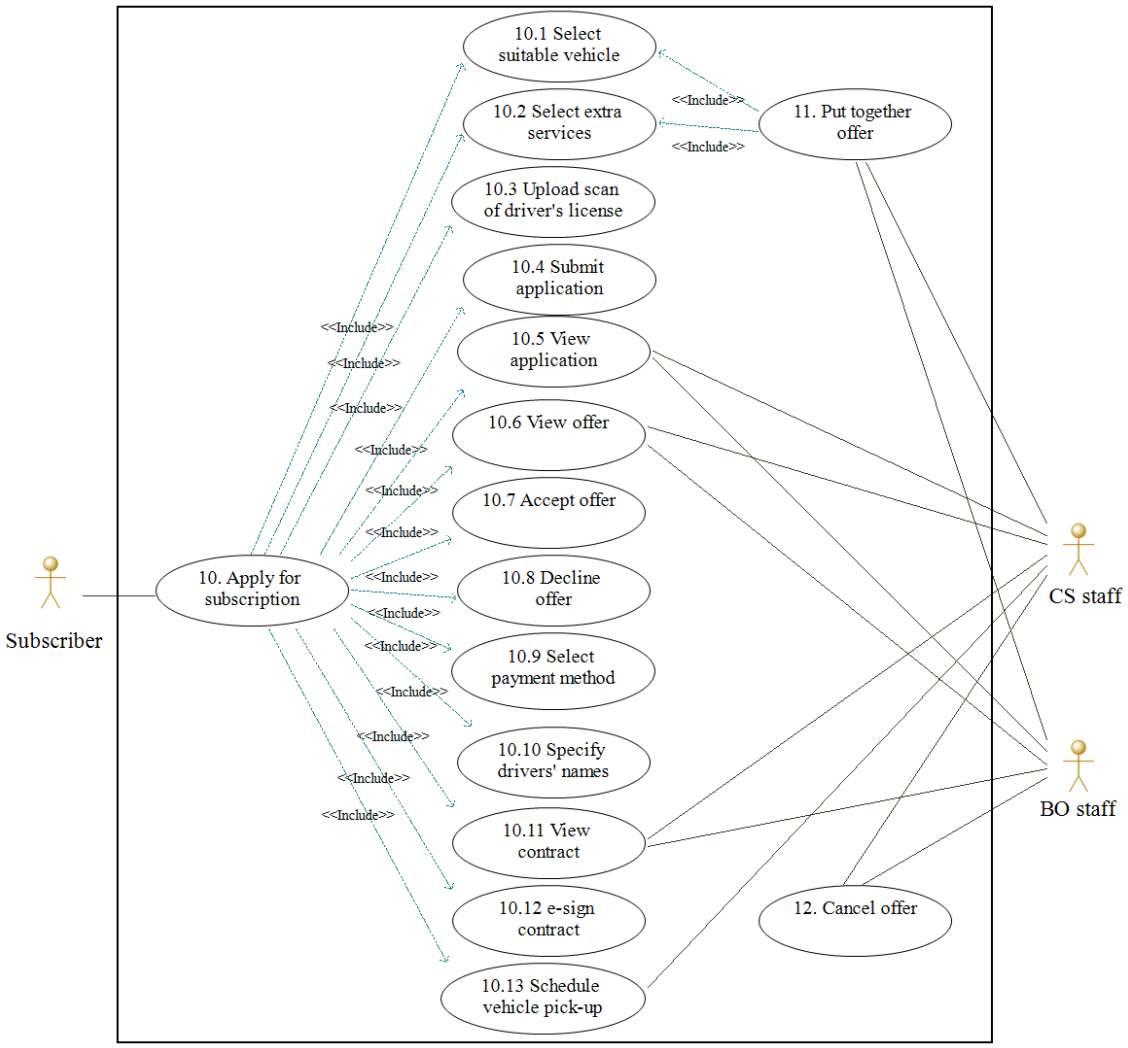

Figure 8: Contract origination main and included use cases (source: author)

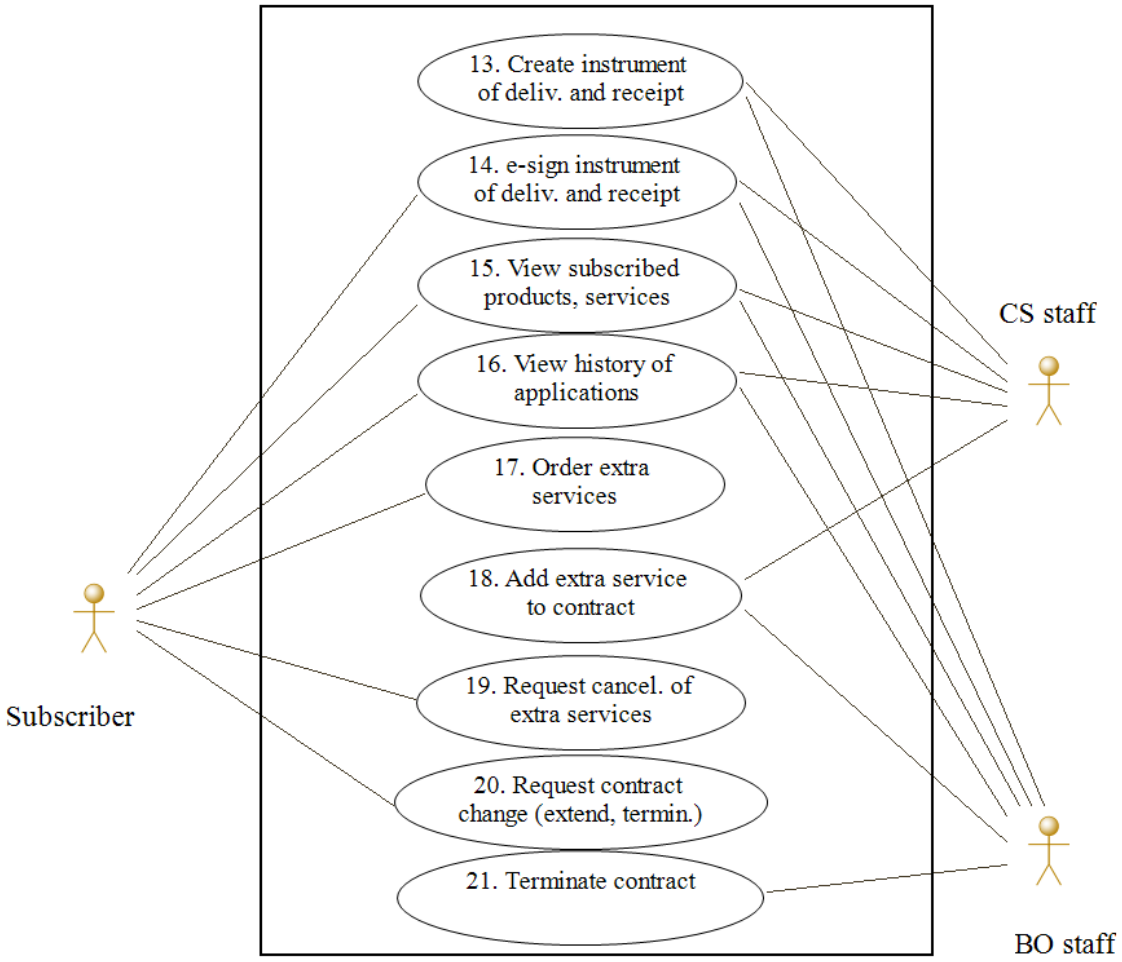

Figure 9: Contract life cycle management (LCM) use cases (source: author)

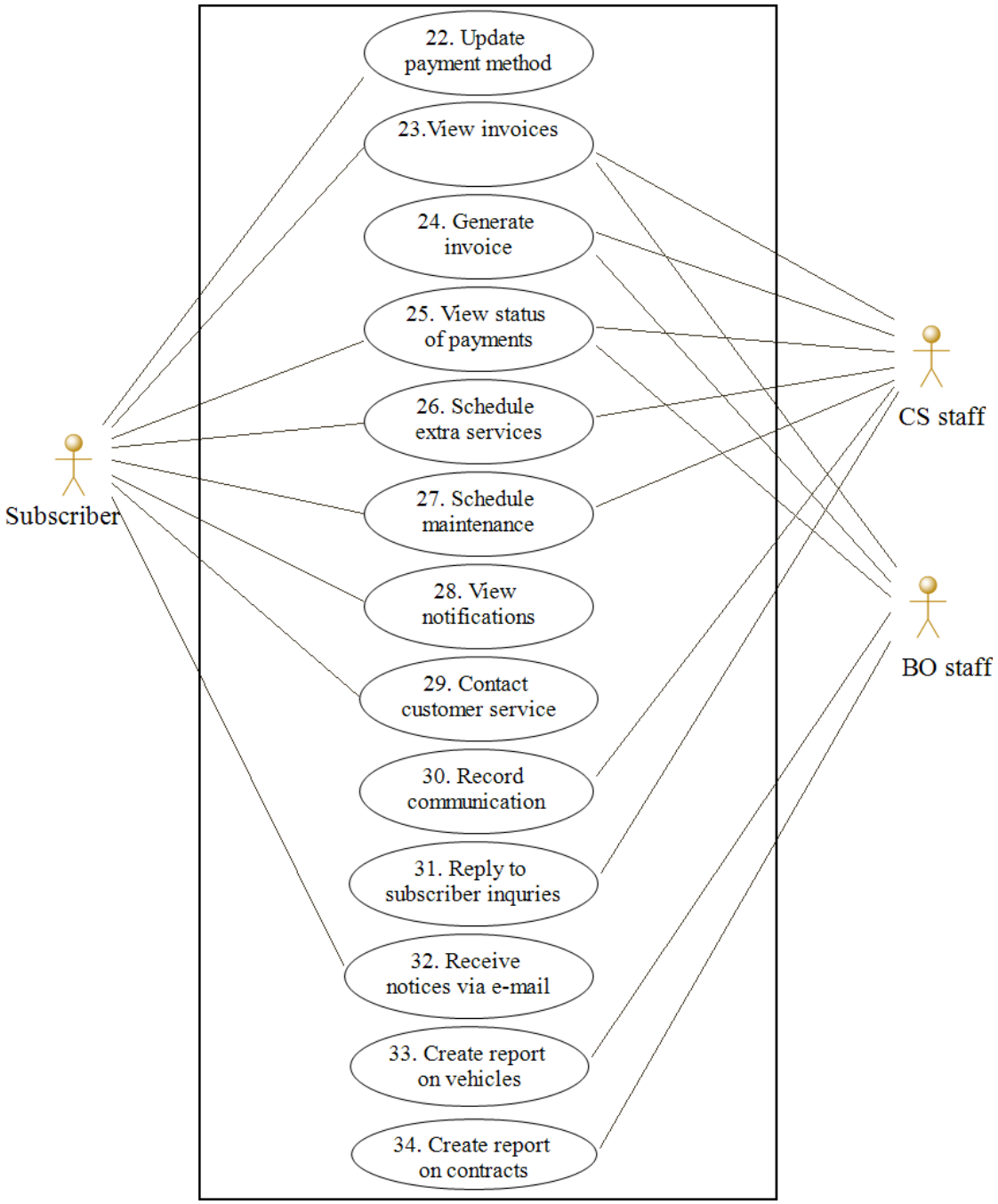

Figure 10: Billing, communication and reporting use cases (source: author)

5.4 Functional Requirements

1. Authentication

1.1 All users of subscription app and staff UI (back-office UI) need to sign in with personal username and password. Minimum password length is eight characters.

1.2 Subscribers must be able to create own user account and choose username and password of their choice.

1.3 There has to be a user management functionality for creating and terminating user accounts for staff and managing their privileges by roles.

1.4 Subscribers and staff need to be able to reset own password.

1.5 It must be possible to set time limit for inactive user sessions, so that users get logged out of the system after a certain period of inactivity.

1.6 It must be possible to configure different roles with different privileges for staff members.

2. Subscriber data

2.1 Initially only private persons are served as subscribers. There has to be capability to extend service to legal persons at a later stage.

2.2 As part of registration the subscriber has to enter his/her full name, date of birth, social security number, residence address, e-mail address, phone number, and validate consent with subscription service provider's terms and conditions.

2.3 Also as part of registration, the subscriber has to upload a photo or scan of his/her driver's license:

2.3.1 It should be possible to upload and store documents in various common formats, and for AFS staff to easily retrieve them when needed.

2.3.2 The authenticity and validity of the driver's license has to be verified.

2.4 Subscribers need to be able to mark marketing preferences. It has to be possible to extract subscribers' contact details by preferred marketing channel.

2.5 Subscribers need to be able to update own contact details.

2.6 Subscriber personal data has to be stored securely and according to data privacy standards (exact requirement to be defined and submitted with other non-functional requirements).

3. Vehicles

3.1 Vehicle database must be set up to include up to date detailed information of each car:

3.1.1 vehicle class,

3.1.2 brand, model, body style, production year, VIN, registration number, registration date, fuel type, transmission, colour, features and accessories, mileage, location,

3.1.3 history of maintenance and repairs, inspections, and accidents with classification of severity level,

3.1.4 status:

- available (available for subscription),
- reserved (in connection to offer or contract),
- temporarily unavailable (for example, for repairs after contract end),
- written off,

3.1.6 current holder with start date of holdership,

3.1.7 related subscription contracts history,

3.1.8 insurance.

3.2 Data can be updated and retrieved from vehicle database in real-time.

4. Product configuration

4.1 It must be possible to configure subscription packages by:

4.1.1 package name,

4.1.2 package description,

4.1.3 vehicle class,

4.1.4 contract duration,

4.1.5 included extra services,

4.1.6 number of allowed car swaps,

4.1.7 whether contract extension is allowed,

4.1.8 how long after contract activation subscriber is allowed to request contract termination,

4.1.9 application expiry days: how many days after application submission it will become expired if it has been accepted by AFS and offer has been created but has not been accepted by subscriber; offer will become expired as well,

4.1.10 offer expiry days: how many days after offer acceptance it will become expired if subscriber has accepted the offer but does not proceed through contract e-signing; application and contract draft will become expired as well,

4.2 It must be possible to configure extra services:

4.2.1 service name,

4.2.2 service description,

4.2.3 part of subscription package, if not then can be added to and removed from contract.

4.3 It must be possible to describe prices for subscription packages and extra services and to specify price validity periods for these.

5. Origination

5.1 Contract origination has to be a three-step process: application, offer, contract.

5.2 Contract origination positive flow should be a fully digital process and not require manual intervention by AFS.

5.3 Subscriber has to be able to filter vehicles and extra services with prices by a range of parameters before logging in.

5.4 Subscriber has to log in to submit an application. If subscriber does not have a user account on the app, then he/she has to register and the authenticity of the scan of his/her uploaded driver's license has to be verified, after which he/she can submit the application.

5.5 After subscriber has submitted an application, a credit assessment needs to be carried out for the subscriber, based on data provided by him/her, relevant data available at credit agencies, and the service level (price of subscription package and selected extra services, and contract duration) that he/she is applying for. The decisions whether to accept the application or decline it should be made by using the risk assessment formula supplied by AFS.

5.6 Provided that the credit assessment decision is positive:

5.6.1 the vehicle should be reserved for the subscriber, and

5.6.2 an offer should be generated for the application and presented to the subscriber for review.

5.7 If the credit assessment decision is negative:

5.7.1 the contract origination process stops.

5.7.2 the subscriber has to be informed that the application could not be accepted.

5.8 Subscriber has to be able to accept or decline the offer.

5.8.1 In case subscriber declines the offer, the contract origination process stops, the application is cancelled and the reservation on the vehicle is released.

5.8.2 In case the subscriber neither accepts nor declines the offer, then the application and offer will become expired in the number of days configured

for application cancellation for the subscription package type. The reservation on the vehicle will be released.

5.9 In case subscriber accepts the offer, he/she has to select preferred method of payment. Available payment methods should include payment by credit card, direct debit and bank transfer. In case of the two former options, the subscriber should immediately provide his/her payment details.

5.10 The subscriber also has to specify if he/she will be the main driver for the vehicle and in addition should be able to enter the personal details for up to two additional drivers.

5.11 When offer has become accepted and subscriber has provided details for his/her preferred payment method and specified drivers, a contract should be generated based on the offer and presented to the subscriber for review.

5.12 Subscriber has to be able to e-sign the contract.

5.13 The e-signed contract should be stored and be easily retrievable for viewing by subscriber and BO staff.

5.14 If subscriber does not proceed through signing in the number of days that is configured for offer expiry days for the subscription package type, then the contract draft, offer and application will become expired. The reservation on the vehicle will be released.

5.15 In case subscriber proceeds through electronic signing, the system should:

5.15.1 update vehicle status data (reservation in connection to contract),

5.15.2 forward certain subscription contract details to insurance provider[1].

5.16 After e-signing the contract, subscriber should be able to schedule vehicle pick-up.

5.17 System should enable manual intervention and support for the contract origination process by AFS staff:

5.17.1 in case there is need for error handling of the credit assessment process (review and edit data provided by the subscriber, repeat credit assessment),

5.17.2 to be able to generate an offer for subscriber based on input received in direct communication with him,

[1] Exact set-up of insurance provision to be confirmed at a later date.

5.17.3 to be able to cancel an offer in case AFS has reason to avoid entering a contractual relationship with the subscriber – in this case application and contract draft would also need to be cancelled.

5.18 AFS staff should be able to generate an instrument of delivery and receipt for vehicle hand-over. It should be possible to print out this document for signing by hand, in which case AFS staff will need enter date of signing to the system. It should also be possible to e-sign an instrument of delivery and receipt, in which case it should be stored and be easily retrievable by subscriber and AFS staff.

See subscription contract origination process model in Appendix 5.

6. LCM (contract life cycle management)

6.1 The subscriber should be able to filter for extra services and request these in the app during contract validity. Ordering extra services should not pass through contract origination process and additional credit assessment is not required, but submitting requests for additional services should only be available to subscribers without overdue invoices.

6.2 The subscriber should be able to request:

6.2.1 cancellation of extra services,

6.2.2 premature cancellation of contract,

6.2.3 extension of contract.

6.3 Subscriber should be able to view history of his/her applications and requests.

6.4 Subscriber should be able to view list of subscribed products and services.

6.5 AFS staff should be able to add extra services and charges to a contract.

6.6 AFS staff should be able to cancel extra services on a contract.

6.7 AFS staff should be able to extend a contract, generate a draft for the new contract on the same terms and present to subscriber for e-signing.

6.8 AFS staff should be able to terminate a contract.

6.9 Dealing with collection activities in cases when subscriber's invoices are long overdue is outside of the scope of the subscription platform and is handled in AFS' existing systems.

See process models for requesting an extra service (vehicle delivery to maintenance) and for premature termination of contract by subscriber's request in Appendix 5.

7. Billing

7.1 During validity of the contract subscriber should be able to update the payment method and details provided during the contract origination process.

7.2 Subscribers should pay for subscription services based on invoices.

7.3 It should be possible to configure compilation of several types of invoices:

7.3.1 regular monthly invoices – generation triggered automatically,

7.3.2 invoices for specific charges, payable outside the regular monthly cycle (including after contract duration end) – generation triggered manually by AFS staff,

7.3.3 invoices created upon premature termination of contract, payable outside the regular monthly cycle – generation triggered either automatically or manually by AFS staff.

7.4 Subscribers should make payments for invoices directly to AFS' bank account(s).

7.5 The subscription platform should be integrated with AFS' accounting system.

7.5.1 Accounting procedures for matching income with invoices issued, keeping track of overpayments (accounted for as prepayments), and calculating penalties on overdue invoices are carried out by AFS.

7.5.2 Once per day the accounting system will be posting data on payments received and charges overdue per invoice issued to the subscription platform.

7.5.3 Before generation of regular monthly invoices, the accounting system will be posting data on prepayments, overdue amounts, and penalties for each subscription contract as input for new invoices.

7.6 Invoices should include the total amount to be paid, a breakdown of the amounts by services delivered, and prepayments, overdue amounts and penalties if applicable. In case the contract has a prepayment that equals or exceeds the calculated monthly invoice, the invoice should still be generated with 0 amount payable.

7.7 Subscriber and AFS staff should be able to view invoices created for subscriber.

7.8 Subscriber and AFS staff should be able to view status of payments by invoice issued.

See regular invoices creation process model in Appendix 5.

8. Reporting

8.1 Can generate reports on vehicles by status, vehicle class and other available data (exact requirements to be specified in due course).

8.2 Can generate reports on contracts by status, duration, date of signing, vehicle class and other available data (exact requirements to be specified in due course).

9. Communication

9.1 It should be possible to send notifications for e.g. overdue invoices, upcoming regular maintenance, marketing materials etc. viewable in the app and via e-mail.

9.2 The subscriber should be able to schedule vehicle pick-up and drop-off, extra services, and maintenance in the app.

9.3 Staff should be able to schedule vehicle pick-up and drop-off, extra services, and maintenance on behalf of the subscriber.

9.4 The subscriber should be able to contact customer service via the app.

9.5 Staff should be able to respond to subscriber queries posted via the app.

9.6 Staff should be able to record instances of communication with subscriber, specifying channel and providing brief description.

5.5 Business Rules and Overall Business Information Model (O-BIM)

The business rules cover the key concepts of the car subscription service and their relationships. The business rules are the basis for the overall business information model in Figure 11.

R01. Vehicle is assigned to vehicle class.

R02. Vehicle has zero or one valid insurance policies. Over the course of vehicle lifetime, it may have many insurance policies. An insurance policy only covers one vehicle.

R03. Subscription package is made up of one vehicle class and zero or more extra services.

R04. Subscriber can access an extra service as part of a subscription package.

R05. Each subscription package and each extra service can have one valid price.

R06. The price of a subscription package depends on the duration of subscription contract and is presented as a monthly price. The price of extra service may be monthly price or for one-time service.

R07. Subscriber is a person, who submits an application for subscription contract, who is presented an offer, and who is the contractual counterparty in a subscription contract.

R08. Subscriber can have one or more subscription applications. An application is related to one subscriber.

R09. Subscriber can have zero, one or more subscription offers. An offer is related to one subscriber and one application.

R10. Subscriber can have zero, one or more subscription contracts. A contract is related to one subscriber, one application and one offer.

R11. Each application, offer and contract is related to one subscription package. One subscription package may be related to zero, one or more applications, offers and contracts.

R12. Offer is related to one vehicle. Over the course of its lifetime, vehicle may be related to many offers, but only zero to one offer at a time.

R13. Contract is related to one vehicle. Over the course of its lifetime, vehicle may be related to many contracts, but only zero to one contract at a time.

R14. Contract is related to zero, one or more contract change events. Contract change event is related to one contract.

R15. Contract change events are related to contract change types, such as contract extension and contract premature termination.

R16. Contract can have zero, one or more instruments of delivery and receipt. An instrument of delivery and receipt is related to one contract.

R17. Contract can have zero, one or more related invoices. An invoice is related to one contract.

R18. Invoice can have one or more invoice lines. An invoice line is related to one invoice.

R19. Contract is related to one main driver and up to two additional drivers. Main driver and additional driver are person roles. A driver may be related to one or more contracts.

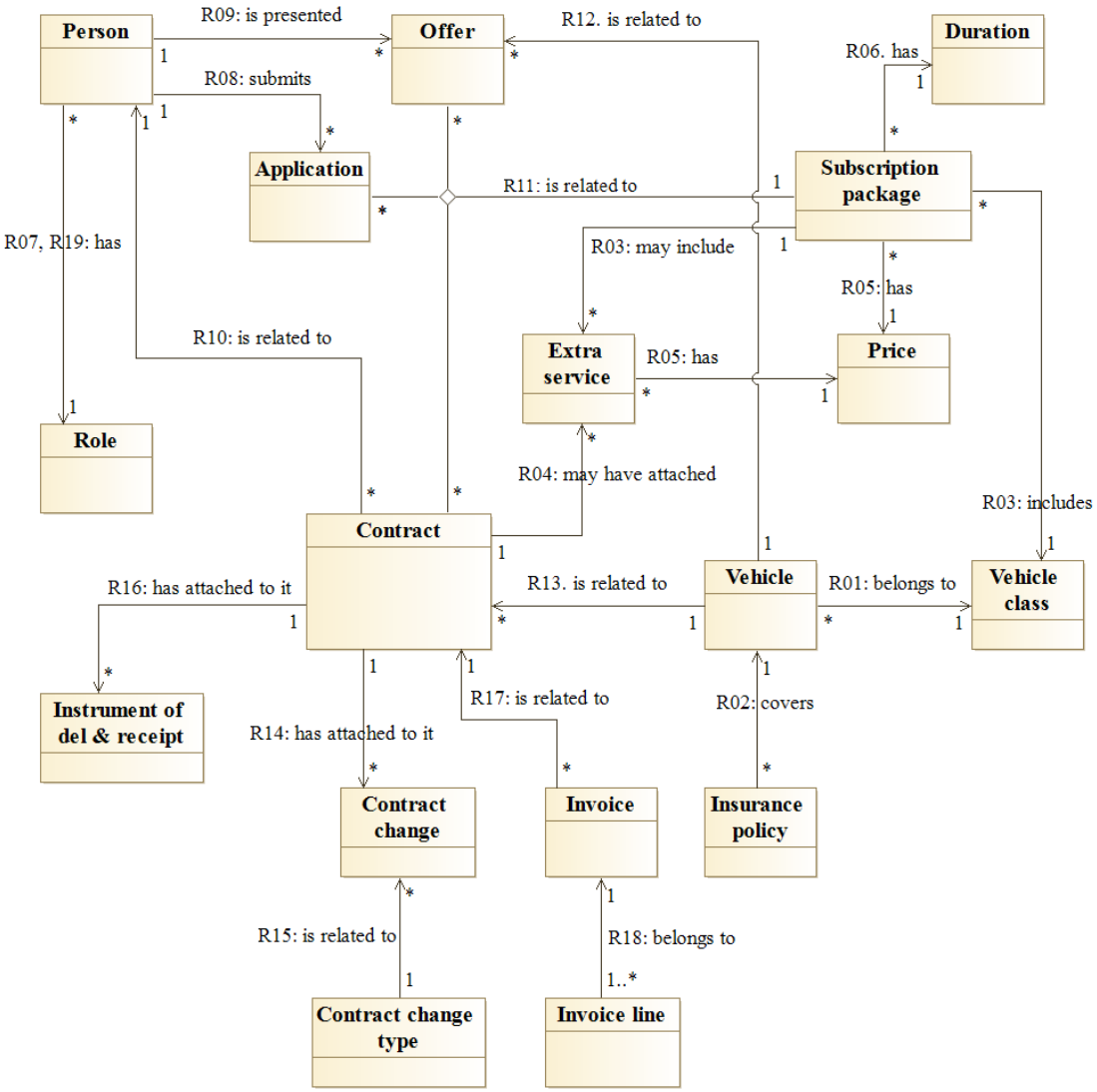

Figure 11: Overall business information model (source: author)

6 Modularbank Platform Technical Description (As-Is)

Modularbank platform is based on microservices architecture. The choice of this design pattern is in line with Modularbank's strategy, as with microservices architecture applications are faster to develop and easier to scale, which enables innovation and accelerates time-to-market for new features [35].

Modularbank started out by offering a few financial services solutions, each consisting of one or a few microservices, or "modules" (see Modularbank logical architecture in Appendix 6). As all modules are independent applications with separate databases, Modularbank has been able to grow in an agile manner, because services can be separately added, updated, deployed and scaled [36]. Currently the number of modules exceeds 20 (see list in Table 2), and this number is increasing as the platform is rapidly evolving. The modules follow domain-driven design [37], which means that each is designed according to the specific business area it serves.

Table 2: Modularbank existing modules [35]

Module	Product / Description
Account-api	Core banking
Aml-api	Integration to anti-money laundering (AML) service providers
Auth-api	Authorisation
Backoffice	Back-office user interface (BO UI)
Camunda	Workflow engine (daychange processes, loan origination process etc)
Card-api	Cards
Collateral-api	Collateral for loans
Currency-api	Currency rates
Deposit-api	Deposits
Finance-api	Financial accounting
Generation-api	Reporting (reports generation)
Loan-api	Lending
Lookup-api	Support module for translations
Monitoring-api	Monitoring performance of modules
Notification-api	Notifications
Payment-api	Payments
Person-api	Customer registry
Reports-api	Reporting
Risk-api	Integration to external credit risk scoring providers

Module	Product / Description
Signature-api	Integration to external digital signing providers
Storage-api	Integration for document storage

Communication between modules and with external systems relies on REST API's and messaging (RabbitMQ) [36]. The API-first approach has been adopted in the development of the platform [ibid.], in order to ensure excellent interfacing with other applications. Messaging enables near real-time business event processing [37].

As financial services often include multi-step business processes, which can be complicated and entail efficiency pitfalls, Modularbank employs a separate service to manage workflows: Camunda [38]. The Camunda workflow engine is responsible for running workflows of several modules: day change processes, loan origination, collateral and deposits related processes.

Focusing on financial services, security has received special attention in Modularbank. All API's use token-based authentication. Access to BO UI is based on roles and privileges. Machine-to-machine communication is authenticated and authorised. HTTPS is used for communication encryption and databases are encrypted with AES-256 [37].

Modularbank is designed to run on the cloud. At the same time, it is cloud agnostic and has a universal deployment model. As can be seen in Modularbank deployment diagram in Appendix 7, Modularbank is deployed in Kubernetes cluster running on AWS.

Other technologies used in Modularbank include Java and Spring Boot for back-ends of modules, React for the BO UI, PostgreSQL for databases, Spring Security as the security framework, and Docker as the application container engine [37].

7 Design of the Subscription Platform

This chapter kicks off with gap analysis between Modularbank existing architecture and the target architecture for the subscription platform. Based on the findings, a component diagram is drawn up for the subscription platform. Lastly, ERD diagrams are drafted for the two new Modularbank modules: subscription-api and asset-api.

7.1 Gap Analysis between Existing and Target Architecture

Analysing and comparing Modularbank's existing functionalities with AFS' requirements reveals that a number of Modularbank modules can be put to use: auth-api, BO UI (backoffice), Camunda, generation-api, lookup-api, monitoring-api, person-api, reports-api, storage-api, and the following APIs for external integrations: aml-api, notification-api, risk-api, and signature-api. There will be some additional development needed for most of these modules to fully support the requirements of AFS: marketing preferences to Person data, subscription contract origination related and invoicing related processes to Camunda, AFS-specific documents generation and storage, new types of reports for new modules to the Reports module, and any needed developments for Risk, Signature and Notification modules to integrate with AFS' preferred service providers.

A new subscription module will need to be developed to cover requirements for subscription-specific product configuration, contract origination process, contract life cycle management, and invoices calculation. It would probably be best to also develop an assets modules for vehicle database, but before undertaking this work the functionalities offered by the existing Collateral module will be revisited. Using Collateral module for subscription assets inventory would go against Modularbank's principle of implementing domain-driven design, but it should also be noted that further development is being planned for the Collateral module in relation to requirements from other customers.

As the subscription app is a customer-facing interface targeting retail customers, a completely new solution should be developed that offers superior user experience and conveys the marketing messages and image that AFS would like to project. Developing

the subscription app falls outside the product development strategy and core strengths of Modular Technologies, thus this work should be procured from another provider.

Also, a number of external integrations will be needed. Modularbank platform will be responsible for running the subscription contract related processes, however there are some complex services required that are not subscription-specific and which have not been developed on the Modularbank platform. These services would be delivered via external integrations to existing specialised service providers: document verification, insurance provision, setting up payments, integration with AFS' accounting system, scheduling for AFS' own provided services and vehicle maintenance by AFS' partner organisations, customer service (CS) software for direct communication with subscribers, and potentially also with credit risk assessment, digital signing and notifications providers, in case Modularbank's existing integrations are not among AFS' preferred service providers.

Modularbank has several APIs for processing different kinds of payments on the accounts of its core banking module (account-api) and cards issued using card-api. AFS' requirements for monitoring income to own accounts from customers' bank transfers, credit card payments and direct debits could be met with the account-api and payment-router-api. However, AFS has decided to leave payments accounting related development out of the subscription platform's MVP scope and in the first stage rely on its existing accounting systems. Thus Modularbank account-api and payments related api's are initially excluded from the subscription platform.

See overview of existing Modularbank functionalities by component and missing functionalities and integrations for AFS' requirement categories in Table 3, and gap analysis matrix in Appendix 8.

Table 3: Overview of existing Modularbank functionalities by component and missing functionalities and integrations for AFS' requirement categories (compiled by the author)

	Requirement category	**Existing components/ functionalities**	**Missing components/ functionalities**
1	Authorisation	Auth-api, Backoffice	Subscription app
2	Subscriber data	Person-api, Aml-api	Subscription app, Aml-api: integration with document verification provider

	Requirement category	Existing components/ functionalities	Missing components/ functionalities
3	Vehicles		Asset-api
4	Product configuration		Subscription-api
5	Contract origination	Camunda, Risk-api, Generation-api, Storage-api, Signature-api, Backoffice	Subscription-api, Subscription app, Asset-api: integration with insurance provider, Risk-api: integration with risk assessment provider
6	Contract life cycle management (LCM)	Backoffice	Subscription-api, Subscription app
7	Billing	Camunda, Backoffice	Subscription-api: integration with AFS' accounting system and configuring payments, Subscription app
8	Reporting	Reports-api, Generation-api	Subscription-api, Asset-api, Reports-api: subscription and vehicles related reports
9	Communication	Notification-api	Subscription app; Notification-api: AFS' customised e-mails, integration with scheduling provider, and integration with customer service (CS) software

7.2 Subscription Platform Components

The subscription platform component diagram is presented in Figure 12. The channels (subscription app as the customer UI and backoffice for BO staff UI) are in the top of the diagram, other Modularbank modules including new subscription-api and asset-api modules in the middle, and required external integrations to the right and downwards of Modularbank. The new Modularbank modules subscription-api and asset-api are highlighted in darker blue. There are no distinctions indicated between existing Modularbank modules in terms of needing further development, as there will be some development required for most of the existing modules and the requirements have not yet been finalised.

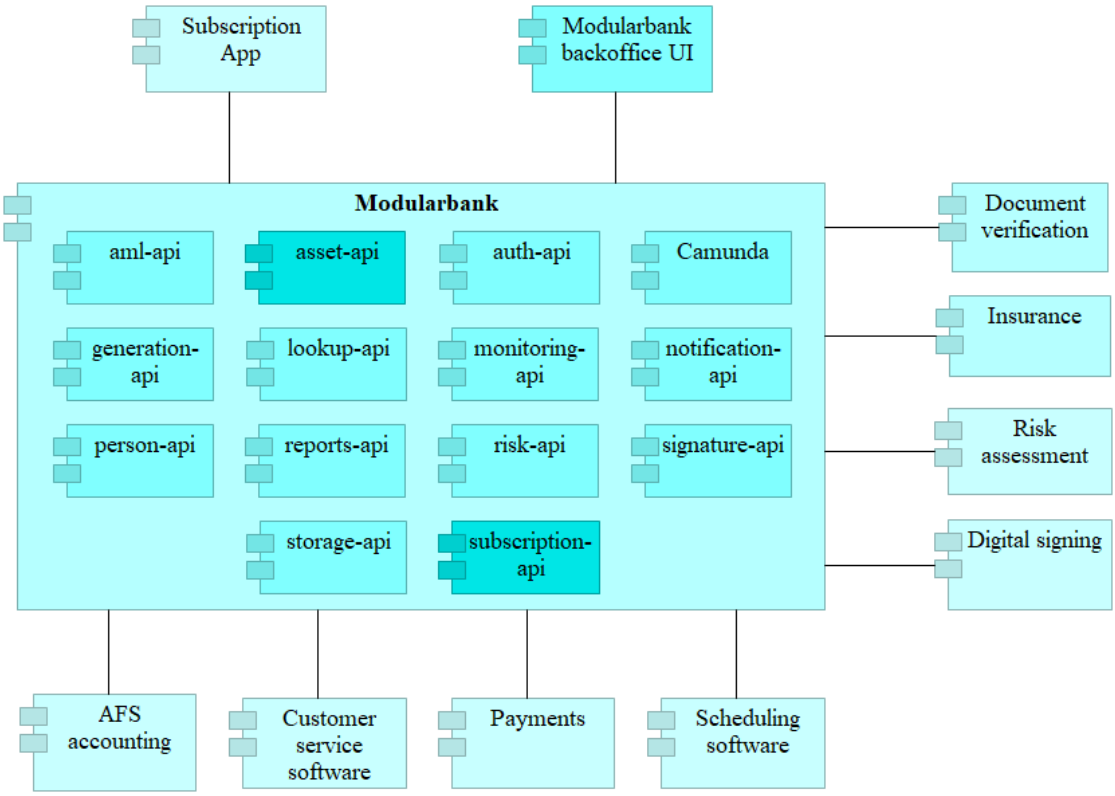

Figure 12: Subscription platform components (source: author)

7.3 ERD Diagrams for New Modules

In the subscription platform target architecture, there are two new modules in the Modularbank platform: subscription-api and asset-api. The ERD diagrams for these are provided as Figure 13 and 14. The ERD diagrams were drafted based on available information on the requirements for the subscription platform. Once the requirements have been finalised in further discussions between Modular Technologies and AFS, the ERD diagrams for subscription-api and asset-api will need to be reviewed for any changes that may be needed based on updated requirements.

Some of the existing Modularbank modules, which will be included in the subscription platform, will also need some changes to their data structures. These changes will be designed once exact requirements have been finalised.

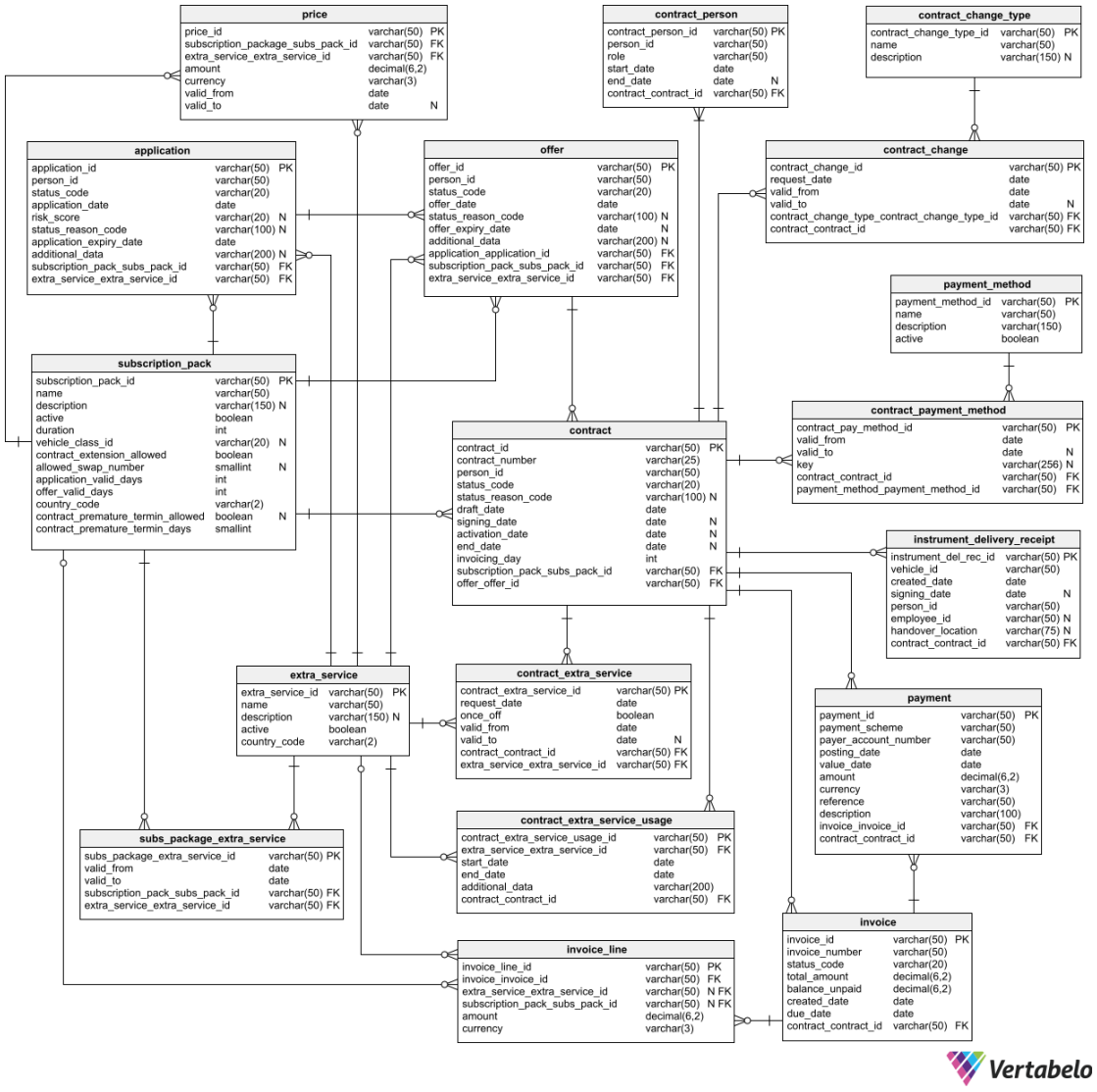

Figure 13: subscription-api entity relationship model (source: author)

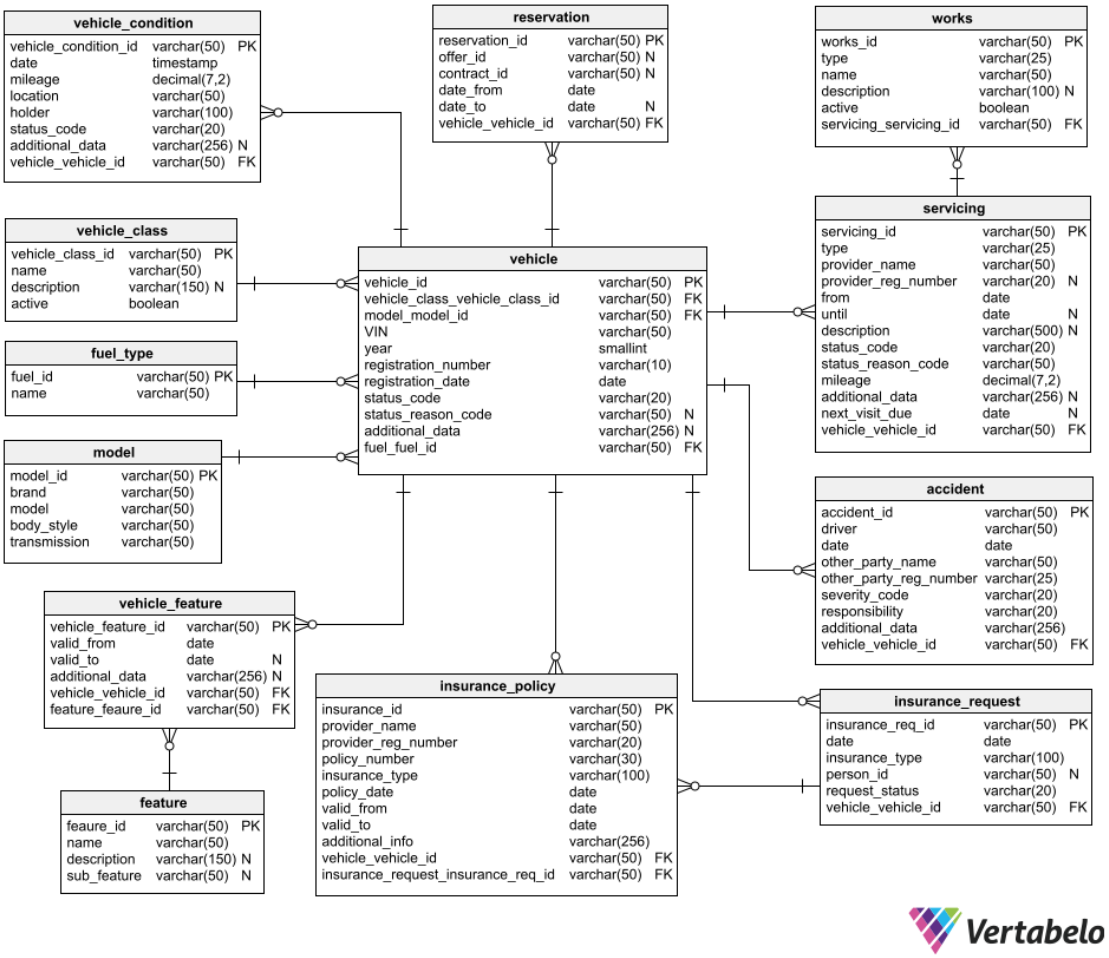

Figure 14: asset-api entity relationship model (source: author)

8 Summary

The relevance of this thesis arose from current business needs of two companies. AFS is witnessing decline in the vehicle leasing market and is seeking a new revenue stream from subscription business, aiming to put its available resources – cars – to more profitable use. Modular Technologies is an ambitious start-up, vigorously extending its financial services supporting platform Modularbank to serve more business lines, and is especially keen to win new customers that offer upsell potential across supported business lines. The subscription business model is flourishing across many industries and expansion into subscription is a lucrative business development area for both companies.

The aim of this thesis was to design a software solution as part of the existing Modularbank platform to support the provision of car subscription as a digital service. The scope of subscription service provision support was delimited to contract origination for retail customers, managing a limited extent of contract life cycle events, and billing for provided services.

Prior to design, several stages of analysis were carried out. First, prevailing trends in FinTech and mobility were researched to understand the strategic drivers and competitive forces that Modular Technologies and AFS are facing. Modular Technologies was studied on Lean Canvas and AFS in ArchiMate Goals View. An overview was compiled of existing subscription software providers in the international market. Based on the analysis it was concluded that cooperation between the two companies offered advantageous opportunities worth exploring further.

Next, the analytical focus was shifted to the car subscription business. The sources used for gaining an understanding of car subscription business and requirements for the software to support it included a list of confidential initial requirements provided by AFS to Modular Technologies, which was discussed at meetings, and desk research on existing car subscription solutions in various countries. Based on the drafted car subscription business description, car subscription service value stream and business glossary were compiled.

As the next step, user requirements were drawn up and graphically summarised on use case diagrams for three main actors: subscriber, customer service staff and back-office staff. Use cases were categorised according to nine capability areas needed for digital subscription service origination and provision. Based on user requirements, more detailed functional requirements were drafted for the nine capability areas. As the last stage in subscription service provision analysis, business rules and the overall business information model were compiled.

As a preparatory step for the architectural and data structure design of the subscription platform, the existing Modularbank platform was studied: its architectural and communication principles, technological pillars, and existing modules.

The design of Modularbank subscription platform commenced with gap analysis between existing and target architecture. Gap analysis revealed that a number of existing Modularbank modules can be put to use for the subscription platform, although some additional development would be required for all relevant modules. Two new modules would need to be developed as part of Modularbank platform: subscription-api and asset-api. The customer-facing interface – the subscription app – would need to be developed by a specialised app developer, and a number of external integrations would be needed with specialist providers: document verification, credit decisioning, payments set-up, insurance, scheduling, customer communications, and AFS' existing accounting software. Based on these findings, a component diagram was drawn up for the Modularbank subscription platform. Finally, entity-relationship diagrams were compiled for the two new Modularbank modules.

The work undertaken as part of this thesis forms the basis for continuing cooperation discussions between Modular Technologies and AFS. The extent of conducted analysis and design enables the partners to review and finalise exact requirements and to start development of the solution without delay.

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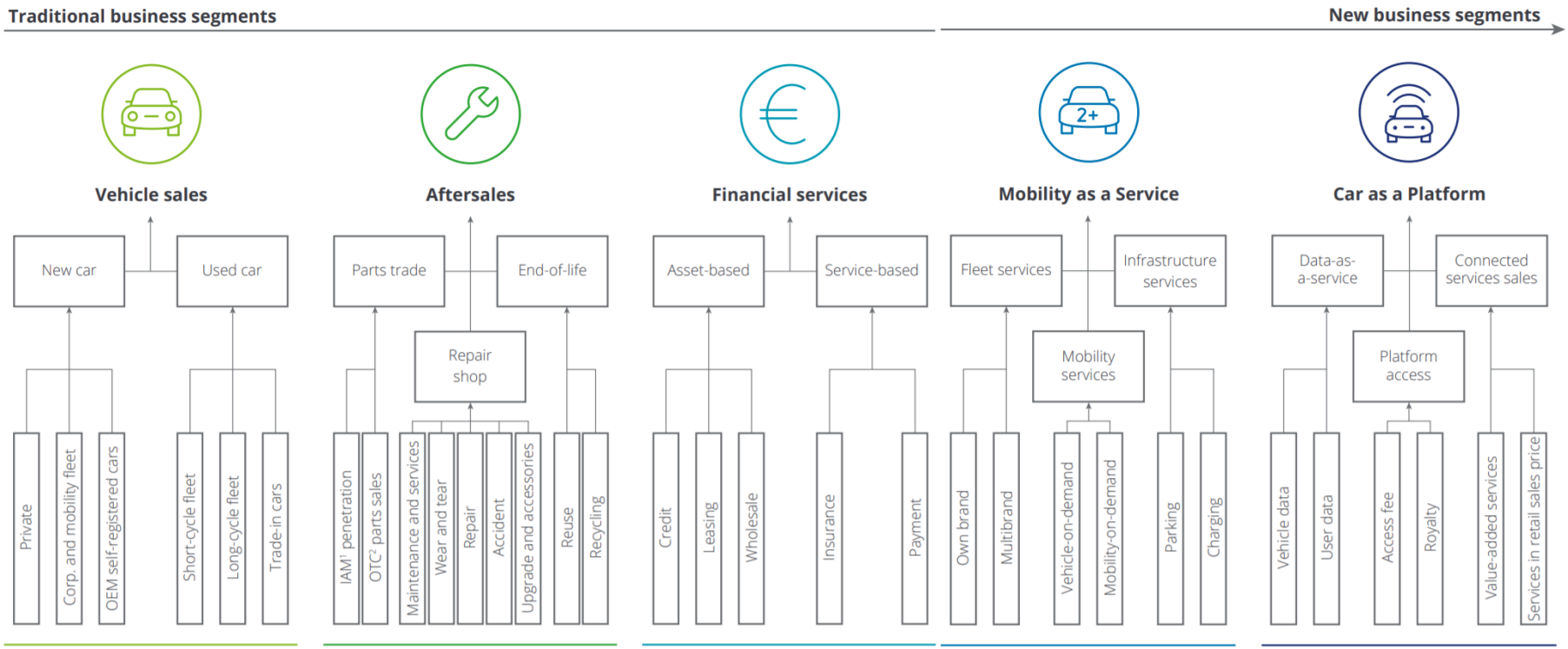
Appendix 2 – Automotive OEM Revenue Tree



Appendix 2. Figure 15: OEM revenue tree [26]

Appendix 3 – User Requirements

Requirements for Subscriber

requirements differentiated between activities in app and materials received to e-mail

Appendix 3. Table 4: User requirements for subscriber (source: author)

In the app:	
Requirement	**Capability category**
Can register as a user: can enter personal and contact information, specify marketing preferences and mark acceptance of Terms and Conditions	Subscriber data
Can log in and out of own user account	Authentication
Can filter available vehicles	Vehicle data
Can select a vehicle to apply for	Origination
Can filter extra services	Product configuration
Can select extra services	Origination
Can enter personal details for additional drivers	Origination
Can upload scans of personal identification documents and other documents	Origination
Can apply for a subscription package including selected vehicle, extra services, and contract period	Origination
Can view details of submitted application	Origination
Can view offer	Origination
Can accept offer	Origination
Can decline offer	Origination
Can view contract	Origination
Can e-sign contract and instrument of delivery and receipt	LCM
Can update personal and contact details and marketing preferences	Subscriber data
Can order additional extra services, provided that he/she has a valid contract	LCM
Can edit personal details for additional drivers	LCM
Can request contract change (extension, premature cancellation)	LCM
Can request cancellation of extra services	LCM
Can view list of subscribed products and services	LCM
Can view history of applications	LCM
Can select appropriate payment method (bank transfer, credit card, direct debit)	Billing
Can update payment method	Billing
Can view invoices	Billing
Can view status of payments	Billing
Can view notification for overdue invoice	Communication
Can receive notifications for upcoming regular maintenance	Communication

Requirement	Capability category
Can schedule vehicle pick-up and drop-off, extra services	Communication
Can schedule maintenance	Communication
Can contact customer service	Communication
Via e-mail:	
Can receive invoice	Communication
Can receive notification for overdue invoice	Communication
Can receive marketing content, including newsletters	Communication

Requirements for BO staff

requirements for the subscription platform

Appendix 3. Table 5: User requirements for BO staff (source: author)

Requirement	Capability category
Can log in and out of own BO UI user account	Authentication
Can view vehicle data	Vehicle data
Can edit vehicle data	Vehicle data
Can configure subscription package	Product configuration
Can edit extra services offered	Product configuration
Can set up prices	Product configuration
Can view subscriber personal and contact information, uploaded identification documents	Subscriber data
Can edit subscriber personal and contact information	Subscriber data
Can view subscriber applications, offers, contracts	Origination
Can put together offer	Origination
Can cancel offer	Origination
Can view subscribed products and services	LCM
Can generate instrument of delivery and receipt	LCM
Can e-sign instrument of delivery and receipt	LCM
Can terminate contract	LCM
Can add extra service to contract	LCM
Can view subscriber requests for extra services	LCM
Can view subscriber requests for contract premature cancellation and contract extension	LCM
Can view subscriber invoices	Billing
Can generate invoice	Billing
Can view status of payments by invoice	Billing
Can create report on vehicles	Reporting
Can create report on contracts	Reporting

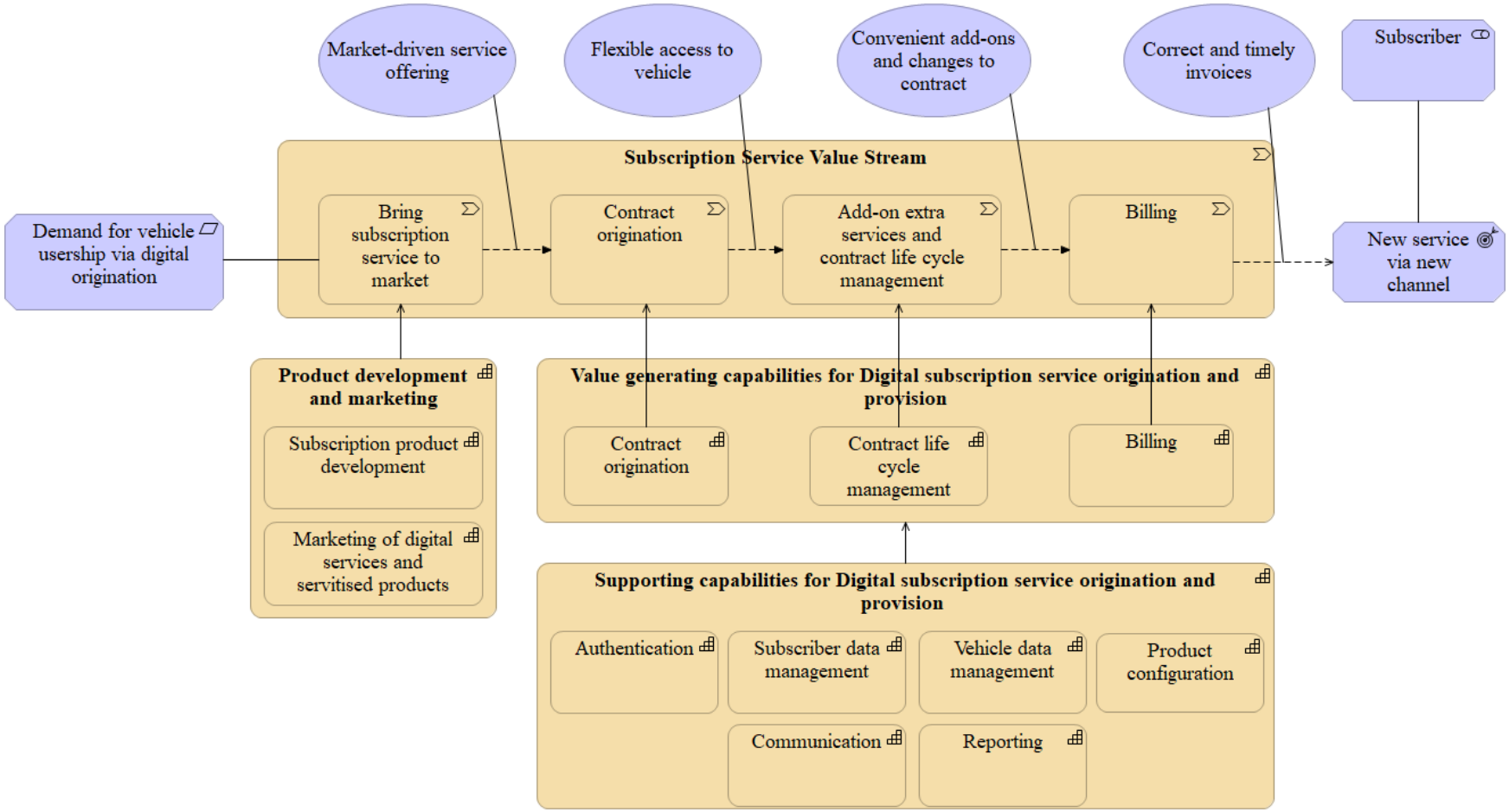
Requirements for CS staff

requirements for the subscription platform

Appendix 3. Table 6: User requirements for CS staff (source: author)

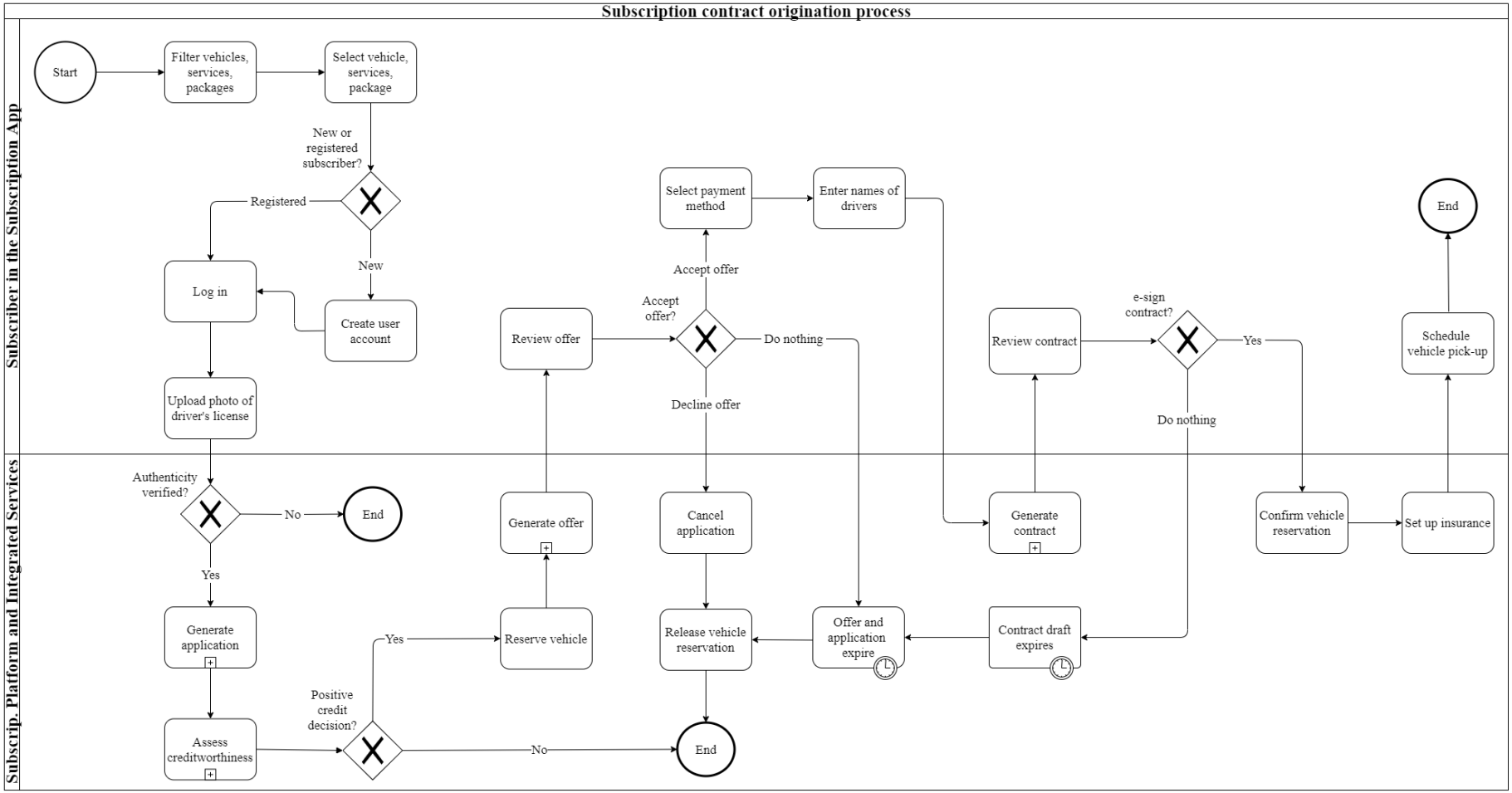
Requirement	**Capability category**
Can log in and out of own user account	Authentication
Can view vehicle data	Vehicle data
Can edit vehicle data	Vehicle data
Can view subscriber personal and contact information, uploaded identification documents	Subscriber data
Can edit subscriber personal and contact information	Subscriber data
Can view applications, offers, contracts	Origination
Can put together offer	Origination
Can cancel offer	Origination
Can view subscribed products and services	LCM
Can create instrument of delivery and receipt	LCM
Can e-sign instrument of delivery and receipt	LCM
Can add extra service to contract	LCM
Can view subscriber requests for extra services	LCM
Can view subscriber requests for contract premature cancellation and contract extension	LCM
Can view subscriber invoices	Billing
Can generate invoice	Billing
Can view status of payments by invoice	Billing
Can record instances of communication with subscribers	Communication
Can schedule extra services on behalf of subscriber	Communication
Can schedule maintenance on behalf of subscriber	Communication
Can reply to subscriber inquiries	Communication

Appendix 4 – Subscription Service Value Stream with Serving Capabilities

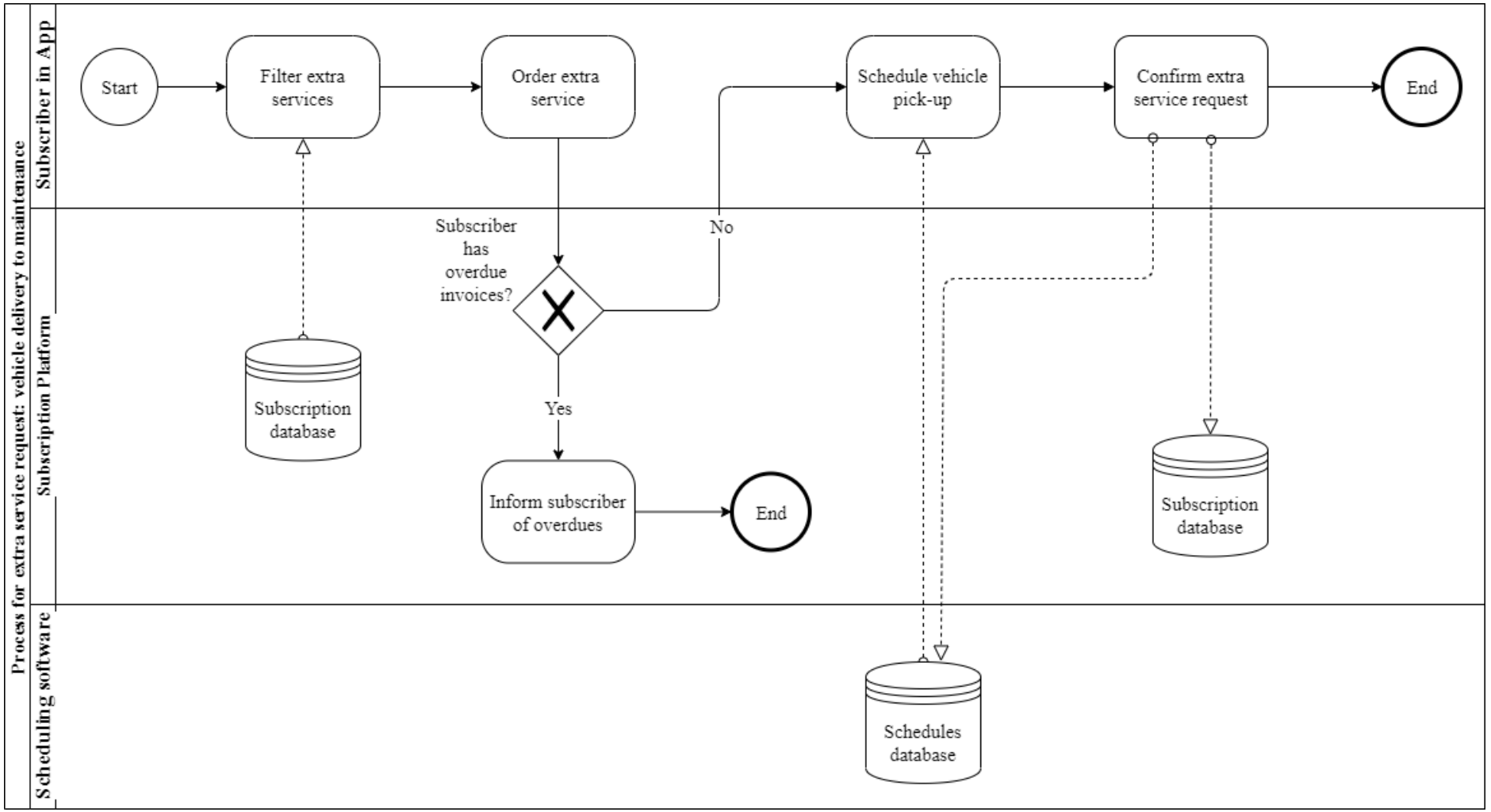


Appendix 4. Figure 16: Subscription service value stream with serving capabilities (source: author)

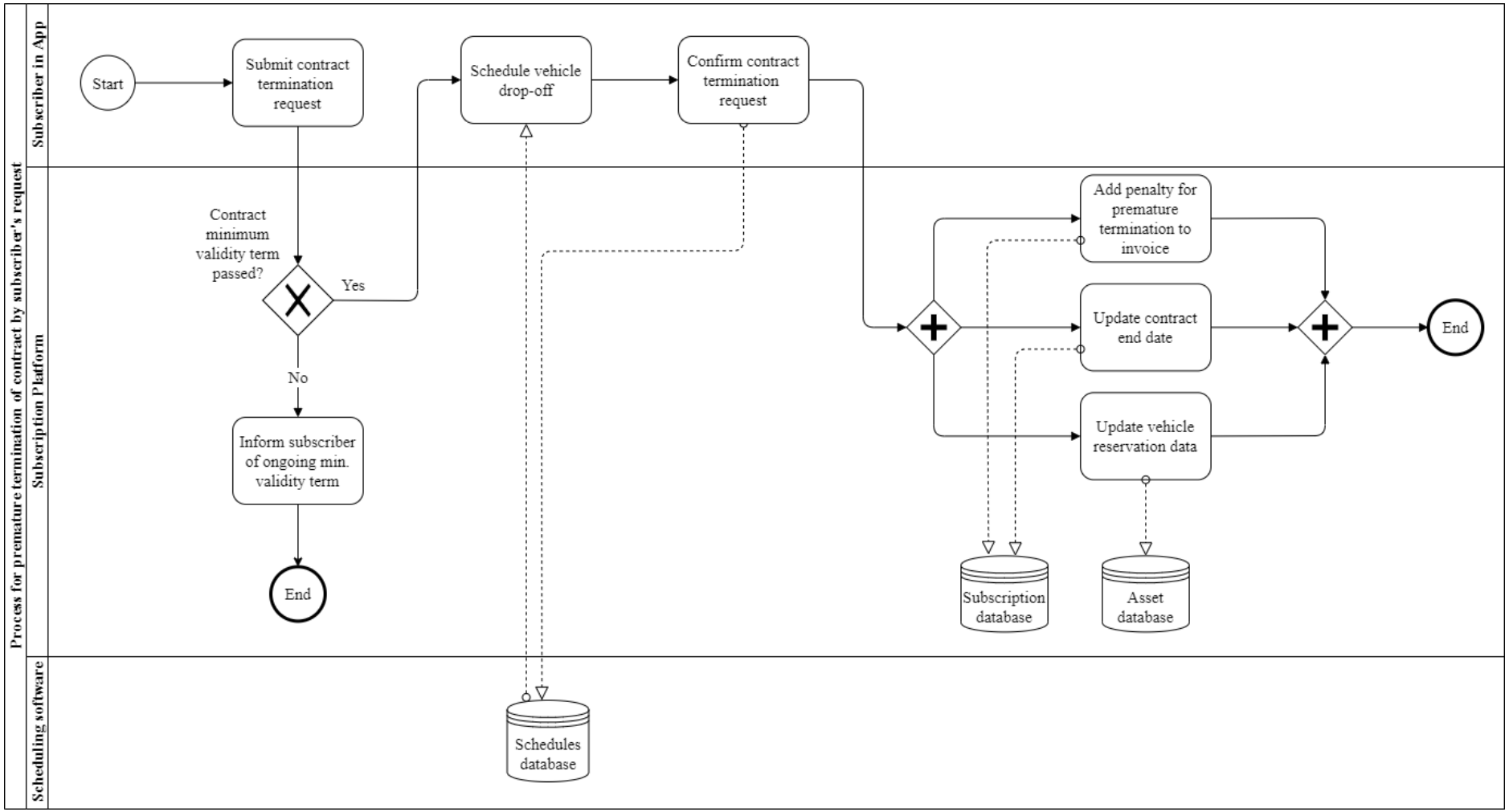
Appendix 5 – Selected Business Process Models



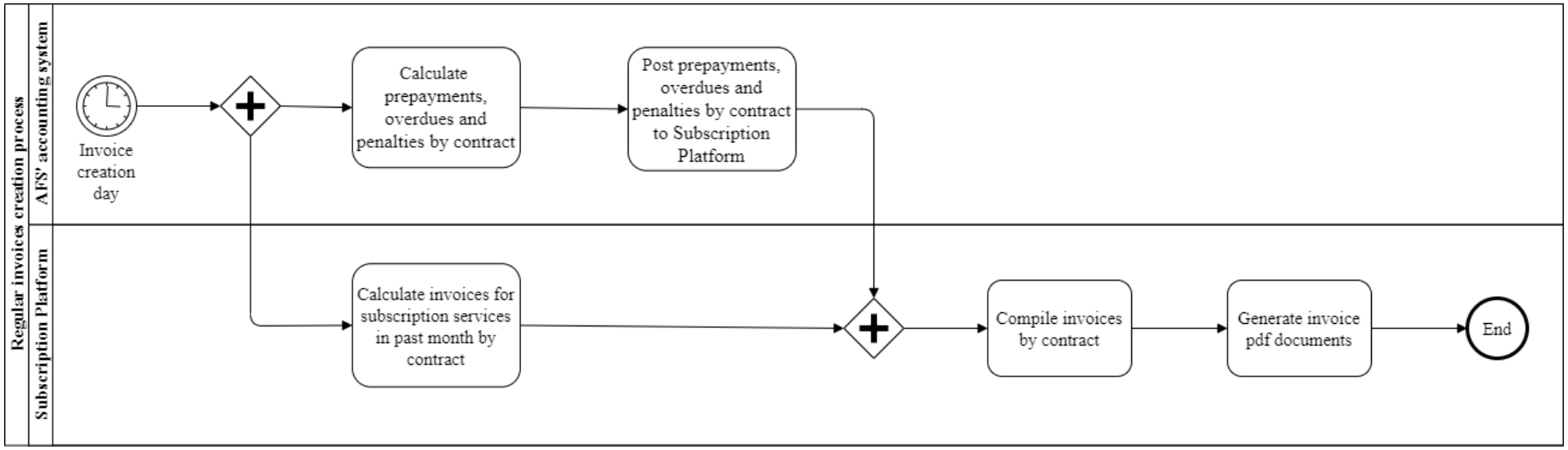
Appendix 5. Figure 17: Simplified subscription contract origination process (source: author)



Appendix 5. Figure 18: Process for extra service request: vehicle delivery to maintenance (source: author)

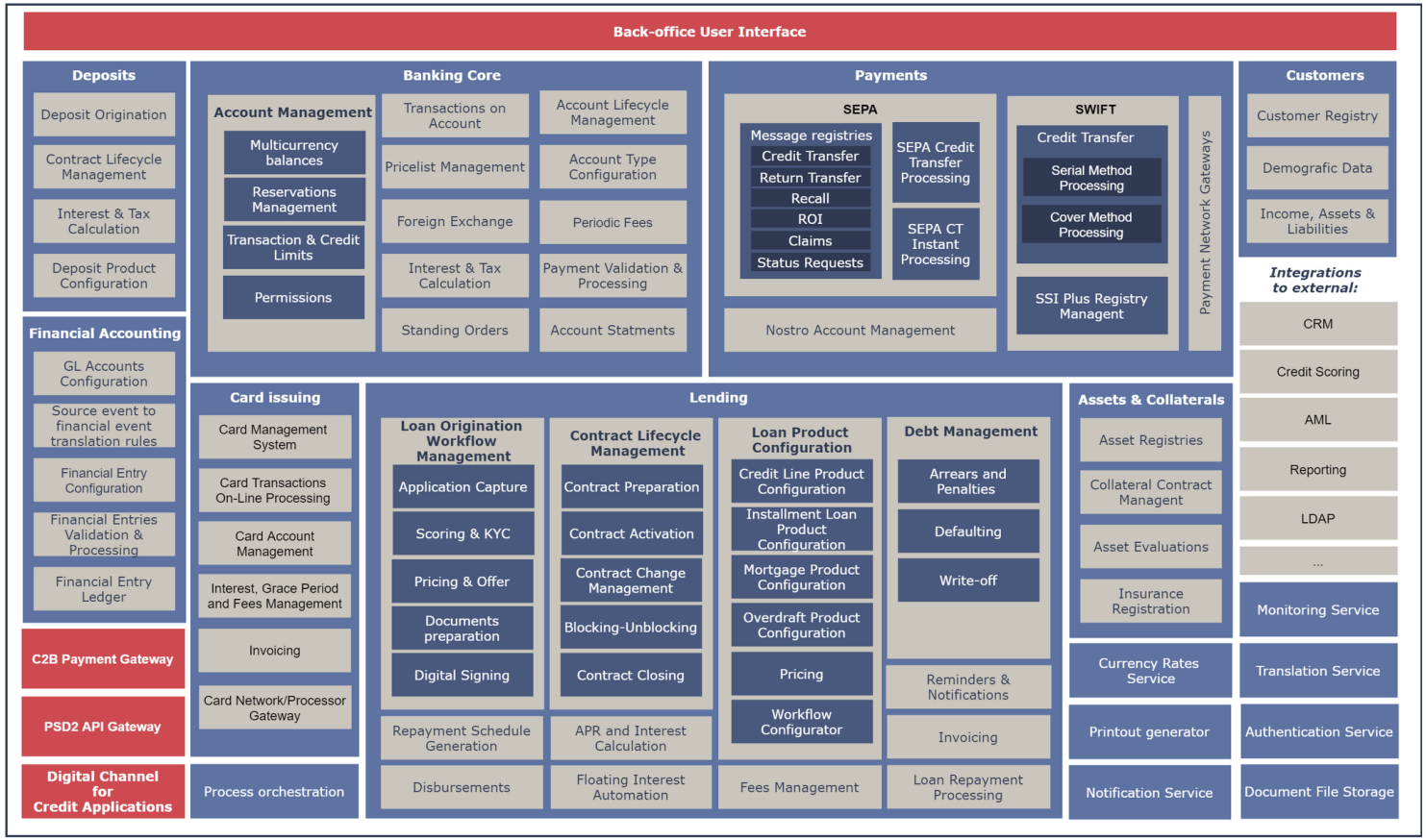


Appendix 5. Figure 19: Process for premature termination of contract by subscriber's request (source: author)



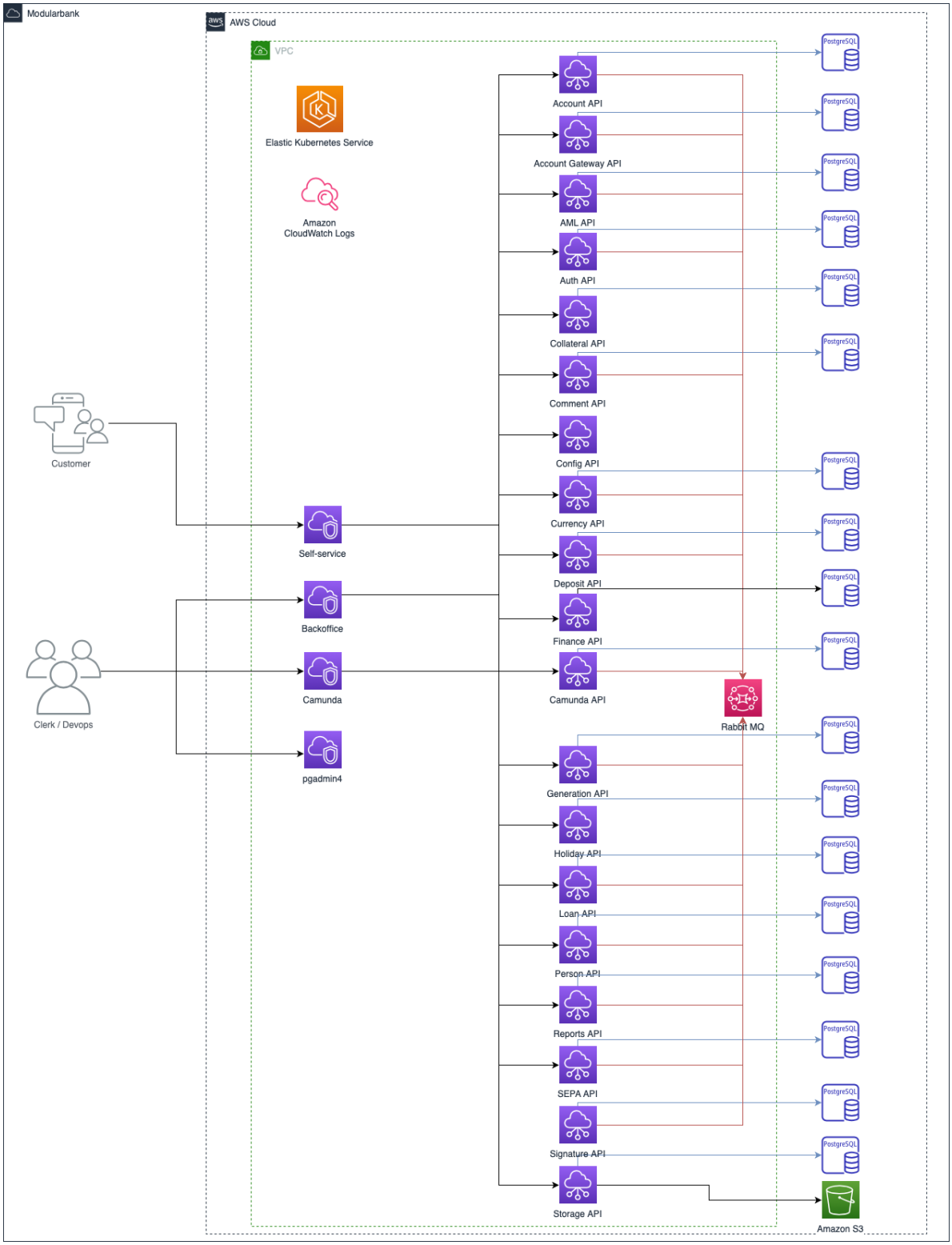
Appendix 5. Figure 20: Regular invoices creation process (source: author)

Appendix 6 – Modularbank Logical Architecture



Appendix 6. Figure 21: Modularbank logical architecture [35]

Appendix 7 – Modularbank Deployment Diagram



Appendix 7. Figure 22: Modularbank deployment diagram [35]

Appendix 8 – Gap Analysis Matrix

Target architecture * / **Baseline architecture**	Aml-api	Auth-api	Backoffice	Camunda	Generation-api	Lookup-api	Monitoring-api	Notification-api	Person-api	Reports-api	Risk-api	Signature-api	Storage-api	Asset-api	Subscription-api	Subscription app	AFS' acc. system	Payments set-up	CS software	Scheduling	Doc. verification	Insurance provider
Account-api																						
Aml-api	incl																					
Auth-api		incl																				
Backoffice			incl																			
Camunda				incl																		
Card-api																						
Collateral-api																						
Currency-api																						
Deposit-api																						
Finance-api																						
Generation-api					incl																	
Loan-api																						
Lookup-api						incl																
Monitoring-api							incl															

Target architecture * / **Baseline architecture**	Aml-api	Auth-api	Backoffice	Camunda	Generation-api	Lookup-api	Monitoring-api	Notification-api	Person-api	Reports-api	Risk-api	Signature-api	Storage-api	Asset-api	Subscription-api	Subscription app	AFS' acc. system	Payments set-up	CS software	Scheduling	Doc. verification	Insurance provider
Notification-api								incl														
Payment- api																						
Person-api									incl													
Reports-api										incl												
Risk-api											incl											
Signature-api												incl										
Storage-api													incl									
New														gap	gap	gap	gap	gap	gap	gap	gap	gap

Appendix 8. Figure 23: Gap analysis matrix (compiled by the author in the format proposed in [1, pp. 236-237])

* None of the existing components will be eliminated as part of subscription platform development. Modularbank platform will continue to provide existing services to other customers when the subscription platform will go live.

New integration to risk assessment and digital signing service providers to be confirmed.