

Experiences of business applications featured by digital signatures – a case study

Markus Stolt

Master's Thesis
Degree Programme in
Information System Management
2018



Author(s) Markus Stolt	
Degree programme Master's Degree Programme in Information System Management	
Thesis title Experiences of business applications featured by digital signatures	Number of pages and appendix pages 32 + 4
<p>The idea of digital signatures was theorized in 1976 and in 1999 they were first recognised in European legislation. In 2018 they are well established as the most trusted way to get documents signed online. The most important aspects of digital signatures are user authentication, content integrity and non-repudiation of the digital signature.</p> <p>The case bank of this study started their digital signature project in 2012 and it was taken into production in the beginning of 2016. Since then a wide variety of contract types and services have been added and integrated to the solution.</p> <p>The digital signature solution has had a profound impact on the process of contract signing, both on the bank and the customers; enabling e.g. the latter to read and accept (or reject) contracts whenever and wherever they can access the bank's signing service. It is estimated that the cost savings of using digital signatures vs. paper-based methods are €3 / signature.</p> <p>Data collection and interviews were used to chart the service lifecycle of services integrated to the solution and to map the changes in business adoption and customer usage of the solution between January 2016 and August 2018. The linear growth in the number of signatures processed by the solution has been, on average, 17% per month. The number of services in the solution has increased from 3 to 74 during that time, ranging from credit card applications to mortgage contracts.</p> <p>The lifecycle management of the services which utilise the digital signature solution follows ITIL very closely with some aspects modelled after the IT Standard for Business. The solution sees continual improvement with requests for change received and collected from all stakeholder parties.</p>	
Keywords Digital Signatures, Cryptography, Banking, Finance, Service Management, ITSM	

Table of contents

Concepts / Abbreviations	1
Parties / Stakeholders.....	1
1 Introduction	2
1.1 Background.....	2
1.2 Purpose	3
1.3 Objectives and Research questions	3
2 Methodology	5
2.1 Data collection	5
2.1.1 Reviewing documents	5
2.1.2 Interviewing individuals and groups.....	6
3 History and concepts of Digital Signatures	8
3.1 Signatures in a nutshell.....	8
3.2 Concept of digital signatures	8
3.2.1 History of digital signatures	9
3.3 Goals and rules of digital signatures	10
3.4 Digital Signatures market today	11
4 Theoretical framework.....	12
4.1 Digital signature workflow	12
4.1.1 Information sent to the signers after a successful signing process	13
4.2 ITIL	14
4.2.1 Service strategy	15
4.2.2 Service design	16
4.2.3 Service transition.....	16
4.2.4 Service operation	17
4.2.5 Continual service improvement	17
4.3 IT Standard for Business - A Model for Business-driven IT Management.....	18
4.3.1 Service management	19
4.3.2 Service portfolio management.....	20
5 Analysis and results	21
5.1 The adoption of the Digital Signature solution	21
5.2 Business Service lifecycle.....	22
5.2.1 Strategy and design	22
5.2.2 Service Portfolio management	23
5.2.3 Transition and operation.....	24
5.2.4 Service Improvement	25
5.3 Customer experiences	27
6 Conclusions	29

References	31
Appendices	33
Appendix 1. Business Services utilising the Digital Signature solution.....	33
Appendix 2. Digital Signature transactions in the Digital Signature solution.....	34
Appendix 3. Interviewees	35
Appendix 4. Interview questions.....	36

Concepts / Abbreviations

Codeserver	Administrative tool for adding new Business Services and changing existing Business Services' parameters on the fly.
DS	Digital Signature.
DS-App	The Bank's Digital Signature Application (for bank clerks) by Avaintec Oy.
DSS	The Bank's Digital Signature Service (for end customers) by Avaintec Oy.
Stateless signing	An API for business applications for completing the digital signing process "in-app" without having to relinquish control to either DS-App or DSS while the process is on-going.
TUPAS	A strong digital authentication method created by the Federation of Finnish Financial Services. TUPAS identification is a de facto standard for digital identification in Finland.
X-Suite	Product family which includes solutions for e.g. digital forms (X-WFM), digital archiving (X-Archive) and digital signatures (X-DSS). Developed by Avaintec Oy.

Parties / Stakeholders

Avaintec Oy	Developers of the X-Suite product family. The Digital Signature solution is built on X-Suite components.
The Bank	A Finnish finance house. Offers e.g. digital banking and non-life insurance claim services to customers.

1 Introduction

This is a study of how Digital Signatures are utilized by business applications in Finnish banking business. The specific bank to which the business details of this study are related wishes to remain anonymous and is heretofore called as “The Finnish Bank” or “The Bank”. The system they are using will be called “The Digital Signature solution” which is utilised by “Business Services”.

The Bank in question has three main business segments: Banking, Non-life Insurance, and Wealth Management.

Avaintec Oy is a Finnish software company specializing in digital services. Avaintec provides secure solutions and the latest technology for digital signatures, forms and archiving as well as provides consultancy services in the field.

Avaintec Oy combines 21 years of solid expertise in project business with a progressive start-up mindset in a new global SaaS world. Avaintec delivers great user experience through service design, easy to use solutions and customer obsessed support. Avaintec worships agile product development, easy going atmosphere and big dreams. Our multi-national Avaintec family (including 18 nationalities) is located in Helsinki (Finland), Hangzhou & Chengdu (China) and Warsaw (Poland). (avaintec.com, 2018.)

1.1 Background

The Bank started their Digital Signature solution project in the autumn of 2012. They selected Avaintec Oy as the developer and provider for a solution which would enable their customers to read and agree to binding contracts without having to visit a bank office and sign the required documents manually.

Avaintec Oy delivered a proof-of-concept solution in early 2013 which integrated one specific business service to the new Digital Signature solution. The pilot service enabled third parties, resellers and distributors, (e.g. car dealerships) to make applications and contracts regarding financing (e.g. car leasing contracts).

Further integrations took place during 2014. Among these was the integration to a content management system which enabled the Bank’s customers to receive digital copies of signed documents to their own personal document archive which they could access through the Bank’s customer service portal.

In 2015 the Bank decided that the signature service would be taken gradually into generic use within the Bank as the preferred method for contract signing. To enable this, Avaintec Oy developed a web application, DS-App, with which the Bank's clerks could send various types of documents and contracts to customers for signing and monitor the progress and state of the documents they had sent. This application was taken into production use in January 2016.

Since then the usage of the solution has grown constantly and the solution receives continuous improvement and development. Recent major feature additions include:

- CodeServer (*see chapter 'Concepts / Abbreviations'*)
- Mobile device support in the Digital Signature Service for customers (DSS).
- Clerks can cancel, correct and resend erroneous documents (e.g. sent to the wrong customer or containing incorrect attachments) through DS-App if the document has not yet been signed by all parties.
- A customer who has been sent a document for digital signing can still sign or reject the document by walking into a branch office and providing acceptable identification. The clerk then uses DS-App to mark the signature status for that signing party as "Signed at the Office" or "Rejected at the Office".
- Stateless signing: (*see chapter 'Concepts / Abbreviations'*)

1.2 Purpose

The purpose of this study is to research the business decisions shaping in the lifecycle management of Digital Signature business applications in the Finnish banking sector. The Bank is used as a case study.

1.3 Objectives and Research questions

The main objective of this thesis is to study the lifecycle and usage of business applications featuring Digital Signatures in a major finance group and how they will bring additional value to the Bank's customers, the bank clerks who create and handle contracts in the Digital Signature solution and to the Bank's business.

The study's point of view is that of the Bank, especially that of the internal stakeholders who are involved in the business decisions affecting the lifecycle of the Bank's business applications which make use of Digital Signatures. The views of the Bank's customers are through customer surveys conducted by the Bank.

This thesis will concentrate on the following main research question:

RQ: *What is the service lifecycle of business services within the Bank's Digital Signature solution?*

Along the route to the main research question, the following supportive topics will be covered:

- What has been the adoption rate of Digital Signatures in the Bank between 01/2016 and 08/2018?
- What kind of Business Services the Bank introduces to their Digital Signature solution and what is the process for introducing a Business Service?
- What are the main benefits of using Digital Signatures in banking business?
- What are the main obstacles/blockers for Digital Signature adoption among customers?

2 Methodology

The research method of this study is qualitative, chosen for its characteristics. It is framed around a case study.

Qualitative research is related to quality, suggesting that the research is focused on understanding and exploring the qualities of a person, place, process, or phenomenon. Qualitative research seeks to explore and represent reality as it exists in context and to enlighten the ways in which individuals experience that reality.

Case study is a form of qualitative research that involves the collection and analysis of multiple forms of data to build understanding about an individual, site, or process. Cases are typically located within a larger context. An important consideration with case study research is bounding, which refers to the parameters researchers set. Boundaries might be thought of delimitations; researchers delimit, or restrict, data collection, analysis, and interpretation based on set criteria. (Biddix & al, 2018.)

The chosen data collection methods are:

- **Reviewing documents:** - Involves the discovery, examination, and evaluation of existing information
- **Interviewing individuals and groups:** - Involves interacting with individual and groups to understand perspectives

2.1 Data collection

2.1.1 Reviewing documents

The Bank's current operational database for the system retains information about every single Digital Signature transaction from January 2016 onwards. For this study, a view which aggregated data from the related tables to a coherent set was created in the db. Another SQL query was written to calculate the total amount of valid DS records (i.e. "Archived", "Rejected", "Expired", "Cancelled") in monthly chunks and pivot the data to a matrix which could be imported to a spreadsheet program. The included four status codes are the ones which the Bank regards as Digital Signature solution usage.

	2016-01	2016-02	2016-03	...	2018-08
Archived					
Rejected					

Expired					
Cancelled					

The monthly figures were used in the spreadsheet program to create the graph shown in Appendix 2.

The Codeserver db, which contains the individual parameters for each Business Service, does not include the creation data as a parameter. To find out the production deployment details, the design documents of the 74 individual Business Services currently in production were consulted.

Business Service	Production deployment date
Change of Loan Terms	yyyy-mm-dd
Visa Credit/Debit	yyyy-mm-dd
Mortgage	yyyy-mm-dd
Savings and Investments Agreement	yyyy-mm-dd

The deployment matrix was also imported to a spreadsheet to create the graph shown in Appendix 1.

2.1.2 Interviewing individuals and groups

Data collection through interviews was conducted through semi-structured interviews.

Semi-structured interviews open up the possibility of exploring topics in a depth and breadth that may be harder to achieve with fully structured interviews. As interviewee comments lead you to ask questions that you hadn't thought of and as they discuss issues that you had overlooked, your understanding of their concerns and perspectives will broaden in directions that you might have missed with a fully structured interview.

Semi-structured interviews can be most appropriate when you are looking to dig deeper, in search of critical comments, design requirements, and other insights. These approaches can be particularly helpful when you are unfamiliar with a problem domain or set of users - when you don't even know which questions to ask. In these cases, semi-structured (or unstructured) interviews give participants the chance to educate you. The understanding that you gain from their comments can help you understand their needs and, potentially, generate appropriate questions for subsequent structured interviews. Follow-up structured interviews can be particularly helpful for validating the results of your initial

semi-structured or unstructured attempts: if a second round of interviews elicits comments that are generally consistent with feedback from the first group, you might comfortably conclude that those comments apply generally to a broad range of users. The Green Living Interviews sidebar describes a research project that made extensive use of semi-structured interviews and other complementary techniques to understand the practices of a very specific group of people, in the hopes of identifying possibilities for the design of new tools. (Lazar & al, 2017.)

The questions were divided into the following themes:

- Strategy and design decisions behind new business services and their adoption
- Service transition and operation of business services
- Business benefits of Digital Signatures (e.g. vs. traditional paper documents)
- Day-to-day user experience benefits for bank clerks using the DS-App
- End customer feedback the Bank has received regarding DSS

3 History and concepts of Digital Signatures

This chapter describes the history, concepts and the three main goals and rules of any Digital Signature solution. A Digital Signature solution needs to enable business management to engage new business services to use the system, enhance the customer experience and streamline the workflow of personnel who deal with documents and contracts which require customer signatures to be valid.

3.1 Signatures in a nutshell

While a signature may simply be a quick and simple stroke of a pen in the paper world, its significance goes far beyond that wet ink scribble:

A signature declares the signer's intent to enter into an agreement and carries a legal weight that can last years, if not decades, depending on the document or agreement. (Harris, 2017.)

3.2 Concept of digital signatures

A conventional signature has the following salient characteristics: relative ease of establishing that the signature is authentic, the difficulty of forging a signature, the non-transferability of the signature, the difficulty of altering the signature, and the non-repudiation of signature to ensure that the signer cannot later deny signing.

A digital signature should have all the aforementioned features of a conventional signature plus a few more as digital signatures are being used in practical, but sensitive, applications such as secure e-mail and credit card transactions over the Internet. Since a digital signature is just a sequence of zeroes and ones, it is desirable for it to have the following properties: the signature must be a bit pattern that depends on the message being signed (thus, for the same originator, the digital signature is different for different documents); the signature must use some information that is unique to the sender to prevent both forgery and denial; it must be relatively easy to produce; it must be relatively easy to recognize and verify the authenticity of digital signature; it must be computationally infeasible to forge a digital signature either by constructing a new message for an existing digital signature or constructing a fraudulent digital signature for a given message; and it must be practical to retain copies of the digital signatures in storage for arbitrating possible disputes later. (Subramanya & Byung, 2006.)

3.2.1 History of digital signatures

Whitfield Diffie and Martin Hellman, in 1976, were the first to explain the idea of an electronic digital signature. They simply conjectured in these kinds of techniques, but quickly after, Ronald Rivest, Adi Shamir and Len Adleman conceived the RSA protocol which could be utilized to create primitive electronic digital signatures. (UKEssays, 2017.)

In their seminal paper “New Directions in Cryptography”, Diffie and Hellman introduced not only a radically new method of key exchange, but also the concept of public-key cryptography, widely acknowledged as one of the most important development of modern cryptography, and finally, suggested how public key cryptography could be used to offer not only confidentiality, but also, authentication services. (Blanchette, 2006.)

Here are some of the milestones in the history of digital signature technology (SIGNiX Blog, 2017; Wikipedia.)

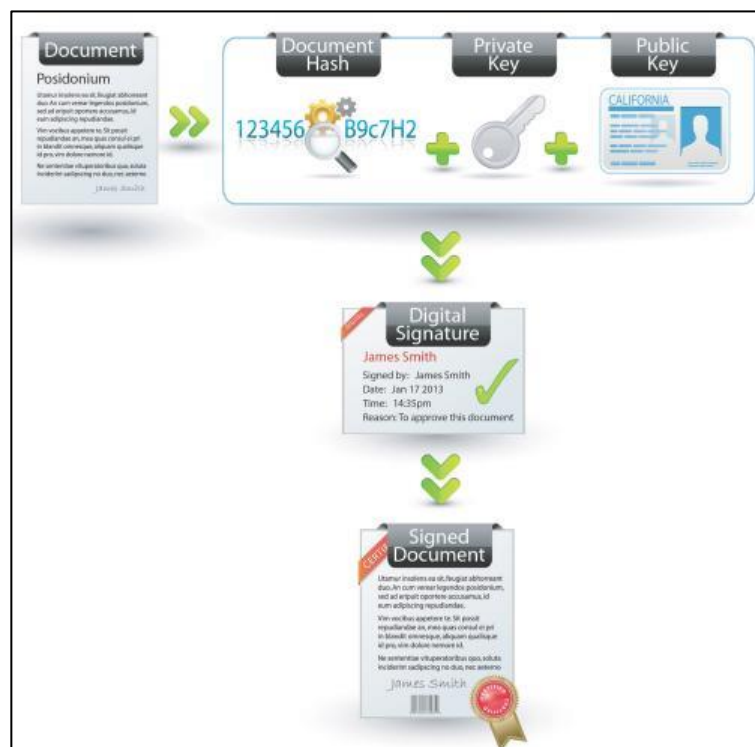
Year	Milestone
1976	Whitfield Diffie and Martin Hellman first described the idea of a digital signature scheme, but they only theorized that such schemes existed.
1977	Ronald Rivest, Adi Shamir and Len Adleman invented the RSA algorithm, which could be used to produce a kind of primitive digital signature.
1984	Shafi Goldwasser, Silvio Micali, and Ronald Rivest became the first to rigorously define the security requirements of digital signature schemes.
1988	Lotus Notes 1.0, which used the RSA algorithm, became the first widely marketed software package to offer digital signatures.
1999	The ability to embed digital signatures into documents is added to PDF format.
1999	Electronic signatures were first recognised in European legislation through the Directive on a Community framework for electronic signature (Directive 1999/93/EC)
2000	The ESIGN Act makes digital signatures legally binding in the United States.
2008	The PDF file format becomes an open standard to the International Organization for Standardization (ISO) as ISO 32000. Includes digital signatures as integral part of format.
2016	The eIDAS regulation (No 910/2014) in the EU ensures legal certainty for cross-border use of e-signatures. It also repeals Directive 1999/93/EC.
2018	Today, digital signatures are well established as the most trusted way to get documents signed online.

3.3 Goals and rules of digital signatures

Digital signatures help enforce security during data transfers. They're are used to meet three important goals of information security: authentication, integrity and non-repudiation: (Mishra, 2017.)

- **Authentication:** - The digital signature helps to assure that the signer is who they claim to be.
- **Integrity:** - The digital signature helps to assure that the content has not been changed or tampered with since it was digitally signed.
- **Non-repudiation:** - The digital signature helps to prove to all parties the origin of the signed content. "Repudiation" refers to the act of a signer denying any association with the signed content.

The following image shows the steps and components required to produce a digitally signed document.



Picture 1. Digital Signature process (AIIM, 2013)

1. The actual document files to be signed (doc, jpg, pdf, txt, etc.) are individually run through a hash function (e.g. md5, sha256). (= integrity)
2. The signer signs with their private key (= authentication)
3. The signer's public key and the document hashes are used to create the digital signature, which is then attached to the signed document (= non-repudiation)

3.4 Digital Signatures market today

According to Statistics MRC, the Global Digital Signature Market is accounted for \$662.4 million in 2016 and expected to grow at a CAGR of 30.0% to reach \$3209.4 million by 2022. Factors like increasing use of digital signature to eliminate fraud, technological innovations and enhanced data integrity, scalability, and transparency are driving the market growth. Increase in adoption of cloud-based solutions will provide opportunity for Digital Signature market. However, implementation cost and incompatibility among various digital signature techniques will hinder the market.

Cloud based solutions is projected to be the largest deployment segment as they reduce the operational cost of implementation. The managed services segment is expected to witness largest market share owing to reduction of the cost of operations as well as they provide integration of Wide Area Network (WAN) and branch networks. North America is the largest market followed by Europe. Europe growth is attributed to growing legal services firms, adoption of digital signature and release of new regulations for electronic signatures by the European Electronic Messaging Association. Asia Pacific is the fastest growing market due to enhancement of digital technologies in countries such as China and India.

Some of the key players in global Digital Signature market are Adobe Systems, Inc, Ascertia, Microsoft Corporation, DocuSign, Inc., Entrust Datacard Corp, Gemalto, Inc, IdenTrust, Inc, International Business solutions LLC, Kofax Limited, Korea SYSTEM's TECH Inc, Kotrade Inc, Right Signature LLC, Secured Signing Limited, Signix Inc and Oracle Corporation. (Statistics Market Research Consulting, 2017.)

4 Theoretical framework

This chapter presents the theory and frameworks used in this study. ITIL is used as the main framework for understanding the lifecycle of business services within the Bank's Digital Signature solution. It is supplemented by the IT Services for Business framework. First there is a short step-by-step walkthrough of a common digital signing process which is basically identical in all Digital Signature solutions involving separate sending and receiving parties.

4.1 Digital signature workflow

Within the scope of The Bank's solution, the bank clerks represent the sending party and the customers the receivers. Application-wise the workflow division is as follows:

- Bank clerks utilise the DS-App to create and send documents to customers for signing
- Customers use the DSS for signing documents

The overall process can be described as follows:

1. The clerk logs in to the DS-App and selects which branch/office they represent (if allowed to represent multiple branches for the Bank) (e.g. "Helsinki / Aleksin konttori")
2. The clerk creates a new signing process (i.e. "document") in the DS-App
3. The clerk uploads/attaches one or more pdf files to the document for recipients to view/read and sign
4. The clerk adds the personal details (SSN (mandatory), name (mandatory), email address, phone number) of the recipients to the document
 - a. OPTIONAL: The clerk defines an expiration date after which signatures will no longer be accepted and the contract lapses
5. The system sends an email message to the customers notifying them that they have pending documents waiting for their signature
6. The customer logs in to the DSS using the required authentication method (TU-PAS being the most common method).
7. The customer opens each pdf file attached to the document and acknowledges they have viewed/read them
8. The customer either signs or rejects the whole document, not the individual files within

- a. If the customer rejects the document, it can no longer be signed by any other party
 - b. OPTIONAL: Customers can opt-in that a “usage copy” is sent to them by email after all signing parties have signed the document (*see chapter 4.1.1*)
9. The system internally updates the status of the individual signing party and the whole signing process
10. Recipient receives an email message about a successful digital signing or rejection
11. Each recipient repeats steps 6-8 unless the document has been rejected by one of the signers
12. (DS-App includes a view which lists the details and status of each document created under the branch office the clerk is currently representing, by default showing only the documents created by the clerk themselves. Through this view the clerk can also cancel a faulty document they have sent. This must be done before it has been signed by all recipients. This ends the process in a similar way as if a customer had rejected the document through DSS)
13. A message is sent to the clerk about the completed signature process
14. The “usage copy” is sent to each recipient who requested one (*see chapter 4.1.1*)
15. The original files and the signature metadata are archived for possible non-repudiation claims in the content management system
16. For the Bank’s customers the usage copy is also stored in their personal document archive, a service in the content management system. This archive can be accessed when the customers log in to their personal net bank

4.1.1 Information sent to the signers after a successful signing process

After a successful signing process, each signing party who opted in will be sent a copy of the document they signed. This “usage copy” can be used for archiving purposes (like a receipt) but it is not the actual signed document. If a repudiation claim arises, the data in the non-repudiation archive in the content management system will be used to verify the claims. The usage copy the signing parties receive is a pdf file containing the following components:

1. A cover page, listing e.g.:
 - a. The document name and identifier
 - b. Creation date of the document
 - c. Status of the signing process (e.g. “Completed; all parties have signed”)
 - d. Recipient names, signing timestamps and the authentication method
 - e. List of files which were attached to the document

f. (Watermark)

2. The original files appended to the cover page

4.2 ITIL

ITIL is a set of detailed practices for IT Service Management (ITSM) that focuses on aligning IT services with the needs of business. ITIL is the most widely recognized framework for ITSM in the world. It is not a standard that has to be followed; it is a guidance that should be read and understood, and used to create value for the service provider and its customers.

The ITIL framework is based on the five stages of the service lifecycle. It consists of 26 processes which are collected into five core publications which directly refer to the service lifecycle stages: (Cannon, Hunnebeck & al, 2011.)



Picture 2. ITIL service lifecycle (Cannon, Hunnebeck & al, 2011)

1. Service Strategy
 - Understanding organizational objectives and customer needs
2. Service Design
 - Turning the service strategy into a plan for delivering the business objectives
3. Service Transition
 - Developing and improving capabilities for introducing new services into supported environments
4. Service Operation
 - Managing services in supported environments
5. Continual Service Improvement
 - Achieving services incremental and large-scale improvements

The following list defines the key characteristics of ITIL that contribute to its global success:

- **Vendor-neutral:** - ITIL service management practices are applicable in any IT organization because they are not based on any particular technology platform or industry type.
- **Non-prescriptive:** - ITIL offers robust, mature and time-tested practices that have applicability to all types of service organization.
- **Best practice:** - ITIL represents the learning experiences and thought leadership of the world's best-in-class service providers.

ITIL provides a framework for the governance of IT and focuses on the continual measurement and improvement of the quality of delivered services from both a business and a customer perspective. This focus has been a major factor in ITIL's worldwide success and has contributed to its usage and to the key benefits obtained by enterprises that have deployed ITIL techniques and processes throughout their organizations. Some of these benefits include: (Moeller, 2013.)

- Increased user and customer satisfaction with the IT services provided.
- Improved service availability, directly leading to potentially increased business profits and revenue.
- Financial savings from reduced rework, lost time, improved resource management and usage.
- Improved time to market for the IT aspects of new products and services.
- Improved decision making and optimized risk for all IT-related processes.

4.2.1 Service strategy

The purpose of service strategy is "to define the perspective, position, plans and patterns that a service provider needs to be able to execute and meet an organization's business outcomes". (Cannon, 2011.)

- **Plan:** - Describes how the service provider will transition from their current situation to their desired situation
- **Pattern:** - Describes the ongoing, repeatable actions that a service provider will have to perform in order to continue to meet its strategic objectives
- **Position:** - Describes how the service provider intends to compete against other service providers in the market

- **Perspective:** - Describes the vision and direction of the organization

In 1987 the Canadian management scientist Henry Mintzberg presented five definitions of strategy from which the four Ps of service strategy are derived. (Mintzberg, 1987.) His fifth form, “ploy”, is not included as it deals with influencing competitors to gain strategic advantage over them.

- **Ploy:** - Describes getting the better of competitors by plotting to disrupt, dissuade, discourage or otherwise influence them

4.2.2 Service design

The purpose of service design is “to design services, together with the governing practices, processes and policies, to realize the service provider’s strategy and to facilitate the introduction of these services into supported environments ensuring quality service delivery, customer satisfaction and cost-effective service provision”. (Hunnebeck, 2011.)

When planning a service, the design needs to consider the four P’s of service design:

- **People:** - People are in charge of providing IT services. These professionals should have the skills and competencies required for providing services.
- **Products:** - The products are the tools, services, and technology used in the delivery of, and support of, the services.
- **Processes:** - Processes support and manage the services being offered so that the services meet customer expectations and agreed service levels. All processes must be measurable.
- **Partners:** - When designing services, vendors, manufacturers, and suppliers should be considered as they will be utilized to support the service once it is live.

4.2.3 Service transition

The purpose of service transition is “to ensure that new, modified or retired services meet the expectations of the business as documented in the service strategy and service design stages of the lifecycle”. (Rance, 2011.)

Service transition processes can be categorized into two groups, based on the extent to which process activities take place within the service transition stage of the service lifecycle:

- Processes with significant activities throughout the service lifecycle. These are processes that are critical during the service transition stage but influence and support all stages of the service lifecycle.
- Processes which have most of their activities in the service transition stage of the service lifecycle. These are processes that are strongly focused within the service transition stage.

4.2.4 Service operation

The purpose of service operation is “to co-ordinate and carry out the activities and processes required to deliver and manage services at agreed levels to business users and customers. Service operation is also responsible for the ongoing management of the technology that is used to deliver and support services”. (Steinberg, 2011.)

The objectives of service operation are to:

- Maintain business satisfaction and confidence in IT through effective and efficient delivery and support of agreed IT services.
- Minimize the impact of service outages on day-to-day business activities.
- Ensure that access to agreed IT services is only provided to those authorized to receive those services.

4.2.5 Continual service improvement

The purpose of continual service improvement is “to align services with changing business needs by identifying and implementing improvements to services that support business processes”. (Lloyd, 2011.)

Fundamental to continual service improvement is the concept of measurement. Continual service improvement uses the 7-step model:

1. Identify the strategy for improvement
2. Define what you will measure
3. Gathering the data
4. Processing the data
5. Analysing the information and data
6. Presenting and using the information
7. Implement improvement

4.3 IT Standard for Business - A Model for Business-driven IT Management

IT Standard for Business is an open source IT management framework, available for everyone and can be freely used to improve the company's IT. The first edition of IT Standard was published in 2009 under the title of ICT Standard for Management. The development was done by the IT management advisory company Sofigate. Since publication, the IT Standard raised a lot of interest and was taken into use in numerous Nordic companies. ICT Standard Forum was then established to develop the framework further and to ensure global visibility. Many renowned IT leaders took part in the development of the second version, which was published in 2012.

IT Standard was created because there was a need for a holistic, but concise framework that can be used both by business and IT. Today, when digitalization is accentuating the importance of IT in every company, a simplified, straightforward and easily applicable IT management framework will help companies to quickly adapt to the changing business environment. The most established models – such as ITIL, COBIT, PMBOK and PRINCE2 – have been developed for specific purposes and operations, such as auditing, service management, and project management. While IT Standard recognizes the need for such models, when going deeper into the daily operations of IT, it proposes a less detailed model, written in everyday language, to be used for IT management and decision making. (ICT Standard Forum 2015.)

The basic framework illustration, called the grid, gives an overview of the five principle elements of IT management which are the following:

- Enterprise Development turns business development initiatives into operational actions in IT.
- Strategy and Governance defines how IT operates and creates value for the business.
- Sourcing and Supplier Management ensures that the company has the services that best fit its business purposes.
- Project and Development Management is essential for organizations to improve and create new solutions to succeed in competitive environments.
- Service Management offers business-aligned services that ensure efficient and uninterrupted business operations.

The framework illustration shows all the elements in relation to each other:



Picture 3. The grid (ICT Standard Forum, 2015)

4.3.1 Service management

Digitalization impacts on Service Management, adds speed and agility to reliability and scalability as the key business drivers. This can sometimes result in favouring cloud-based applications that require no IT management at all. This approach, however, does not take into account that there is a need for integration and compliance with corporate data and security policies. The role of Service Management is to address the business needs and be able to combine agility with reliability.

The services offered by IT must conform to the continuously changing requirements and needs of the business. Service Management is responsible for the continuous improvement and development of services, while, at the same time, it needs to constantly manage and monitor performance in order to ensure the business purpose fit and quality of services. Service Management consists of the following key functions:

- Service Portfolio Management (see *chapter 4.3.2*)
- Enterprise Information Management
- Service Development and Design
- Service Integration and Quality
- Service Transition and Operations
- Self-Service and Automation

The key objectives of service management are:

- Continuous development of services with effective utilization of digital opportunities and service automation.
- Ensure service continuity for business operations.
- Produce the agreed services cost-efficiently and according to the service promise

In recent years, the methods and tools for Service Management have progressed dramatically. Whereas the development has so far been mainly from the standpoint of IT and driven by IT, future efforts will increasingly focus on the development of Service Management from the standpoint of Business, which is the customer. This trend will allow IT and Business to operate in closer cooperation, enabling better identification of solutions that support Business and shorten the response time of IT.

The continuously changing external operating environment, cost pressure and personnel turnover create challenges for Service Management in all companies regardless of their size or line of business. Although every company is unique, companies of equal size generally face similar problems. (ICT Standard Forum, 2015.)

4.3.2 Service portfolio management

From the business point of view, it is essential that IT services are reliable and fit for their business purpose constantly. Business-driven development initiatives require development of existing and new services. All these needs must be collected, evaluated and prioritized carefully so that limited resources and investments can be allocated optimally. It is also essential to continuously monitor the fit for purpose and the performance of current IT services and retire the services which are no longer valuable.

Service Portfolio Management is tightly tied to Service Lifecycle. It ensures that: (ICT Standard Forum, 2015.)

- Business is provided with the right set of services
- Services are fit for the business purpose and aligned with IT strategy
- Performance of the services is at the right level
- Services are organized effectively with the best fit service providers
- Resources and costs are optimized throughout the life cycle

5 Analysis and results

According to Avaintec's CEO, the cost savings for a company using a Digital Signature solution instead of "traditional" signing methods is about €3 per signature. This is the benefit for the business. According to the Bank there are no figures showing the corresponding savings to the customers, who receive the documents for signing. The customer surveys conducted by the Bank show that the fact that you can browse, read and meditate on the contracts you have received at your leisure is the most commonly cited benefit for customers to select digital signing as the preferred method for accepting a contract.

5.1 The adoption of the Digital Signature solution

The production usage of the Digital Signature solution started in January 2016 with three business services (*see Appendix 1*). By the end of the first month of production usage, 281 documents had been signed digitally (*see Appendix 2*). By the end of 2016, there were 11 business services in production and approximately 46500 documents had been signed, out of which approx. 5900 in December alone.

The graph in Appendix 2 shows a tall spike in the signature counts for September 2016. The interviewees say that during that month there was a merge window for creating net bank contracts to customers from branch offices which had merged to the main Bank that year. That month the signature rate climbed to approx. 18000, a figure which was subsequently reached under "normal" production loads only a year afterwards, in September 2017. The interviewees also said that the merge functioned as the first true load test for their Digital Signature solution, as the monthly load tripled from the previous month.

Another spike can be seen to have happened in December 2017-February 2018 when the Bank introduced their first stateless business service (*see chapter 'Concepts / Abbreviations'*). This business service was the new "Savings and Investments Agreement" (SalA) which was gradually rolled-out to relevant customers starting with smaller branches in November 2017. The roll-out was done on a bank-by-bank basis and the customers were sent SMS messages notifying that their new SalA was available for them in the Bank's customer portal. The largest branches, including Helsinki, were included in January 2018, which saw by far the highest monthly signature amount up until the end of August 2018 where the statistics for this study end. The average monthly growth of Digital Signature solution usage on a linear scale between January 2016 and August 2018 has been 17%.

The introduction of new business services to the solution was fairly slow during the first year of production usage. By the end of 2016, there were 11 services in use. That figure

more than tripled by mid-2017 to 36, a figure which itself has doubled by the end of August 2018.

With the introduction of the Codeserver administration tool it became possible to group the individual business services into larger groups so that the bank clerks using the DS-App had easier time navigating through the growing list of available services. By August 2018 the largest business service groups are:

- Loans
- Private Customer Cards
- Corporate Customers
- Real Estate
- Savings and Investments
- Insurance Savings and Life Insurance
- Other Insurances

On average the business services of the “Loan” type see the highest number of signed contracts per month. The business services of this type include the application for a change of loan terms, e.g. for an instalment-free period, and mortgages.

Except for two specific cases, all business services introduced since the beginning of the proof-of-concept period are still in production use. The two exceptions are the services for creating net bank accounts for the customers of merged branch offices mentioned above in this chapter. They were retired when the merge window closed at the end of 2016.

5.2 Business Service lifecycle

5.2.1 Strategy and design

The value of a service is determined by the customer. In the case of Business Services within the Digital Signature solution there are both internal and external customers – bank clerks and the Bank’s customers. Both define their value needs in terms of three areas : (Cannon, 2011.)

- Business outcomes achieved
- Perceptions
- Preferences

The business outcome from a Digital Signature process is the signed business contract which cannot be repudiated. The perceptions of users, clerks and customers, can be, and are, influenced by e.g. prior experiences of using a similar service or the relative endowment of colleagues and peers. Their preferences are consciously and sub-consciously influenced by their perceptions.

One of the design parameters for the DS-App was that a bank clerk should be able to create and send a new document in 30 seconds if all required information is available to them (customer details, files to be attached, etc.). Creating documents for digital signing is not assembly-line work and clerks do not roll-out new documents every half-a-minute. Whether creating a document takes 30 or 60 seconds does not alter the final business outcome but it can be crucial for the perception of the solution.

Preferences come into picture with the customers and the DSS. If the customers' perception is that they gain from the utilizing the service, they will prefer using it to going to the bank office and signing the document "the traditional way".

The solution didn't initially provide for an option to "traditionally" sign a document sent to be digitally signed. Based on customer feedback, a feature was added in 2017 which made it possible for a customer, who had been sent a document for digital signing, to go into a branch office and sign a paper copy of it there. In these cases, the clerk uses the DS-App to mark the signature status for that signing party as "Signed at the office". The customer can also state their intent not to accept the document in which case the signer's status is set to "Rejected at the office" and the documents overall status to "Rejected".

5.2.2 Service Portfolio management

The Business Service portfolio consists of services which are in the funnel or pipeline (future), service catalogue (present) or retired (past).

Business Services in the pipeline start their lifecycle as a request from a business unit to the Process Owner of Digital Signatures to add a new service to the Digital Signature solution. The request is in the form of a survey form which describes the purpose for the service and lists all possible integrations and parameters available for the services in the Codeserver. Based on the description the required integrations are chosen and the form is sent to the Service Owners of the integrations for them to fill the values for the parameters related to their integration component. The Service Owner of the Digital Signature solution with help from the Codeserver Administrator then decide on such basic parameters as ex-

piration times, notification timers, locked/default/hidden values, etc. One of their more important decisions is the new services place in the hierarchy (i.e. the service group it belongs to, see chapter 5.1). Transitions from pipeline to active service catalogue, and finally to retirement are described in the following chapter.

5.2.3 Transition and operation

New Business Services are taken into use through a three-tiered deployment model:

1. **KEHI:** - Development environment to which new stuff is pushed continuously. Some integrations are only available as mock services (i.e. they only check the validity of the incoming request and send back a return value)
2. **JTY:** - System test environment. This environment is normally kept at production levels, except during those times when a new release candidate is tested there. Full integration services are present.
3. **TUOT:** - Production environment. New releases are deployed there through the release and change management process the Bank has defined for the environments which the Digital Signature solution uses.

The expected impact of a new Business Service on production is determined by the Change and Release Manager, roles executed by the Service Owner of the Digital Signature solution. A standard change/release, which is a Business Service with few integrations or one that is otherwise deemed low-risk, can be approved for production deployment by their authorization. For normal changes/releases, which are related to Business Services with multiple integrations and/or complex parameterisations, the approval is subjected to a Change Advisory Board (CAB) which is chaired by the Process Owner of Digital Signatures for the Bank.

Standard releases can be deployed to production immediately following the approval. For normal releases, there is a mandatory 10 day waiting period.

Each Business Service has a mandatory expiry date parameter in Codeserver. A Business Service can be installed in production with the expiry date initially in the past so that the Codeserver Administrator can do final checks while the service remains invisible for the bank clerks using the DS-App. The dates of availability for new Business Services are listed in the Bank's intranet and the Codeserver Administrator will then set the expiry date to a date in the future on that day to make the service available. The Bank will also conduct trainings for bank clerks who have never previously used the Digital Signature solution when a Business Service related to their work flow is introduced.

A new Business Service is initially set in “read+write” mode, which means that bank clerks can both send and view documents of that service type. Sending rights also imply the rights to cancel erroneously sent documents. As mentioned in chapter 5.1, all but two of the Business Services which have seen production use, are still in use. The two services in question were retired by setting their expiry date in Codeserver to the past, which made these services “read-only”. This means that the bank clerks can still view the documents they have sent of this type but they can no longer create and send any new ones as the selection for that service type is no longer available due to expiration.

There also exists a process for completely deleting a business service and all documents of that type from the Digital Signature solution, but it has never been used to this date. This deletion would not have an impact on non-repudiation, however, since the non-repudiation data is stored in the content management system which is external to the Digital Signature solution.

5.2.4 Service Improvement

Avaintec has developed a reporting system in the Digital Signature solution which provides analytics data about the solution usage to the Service Owner, Process Owner and selected other individuals. The data is collected from the solution’s operational database and include e.g. the following information about each Digital Signature process from the reporting period:

- Business Service name
- Number of attached files
- Total size of attached files
- Lead time from document creation until the process finishes (in successful signature, expiration, cancellation, rejection, error, etc.)
- Sending bank clerk’s user id
- Bank / branch name
- Number of recipients
- Recipient type (private person / person signing on behalf of an organization)
- Recipient’s age (based on their SSN)
- Recipient’s gender (based on their SSN)
- Timestamp of document creation
- Timestamp of signature process ending (in successful signature, expiration, cancellation, rejection, error, etc.)
- Signature process state (Archived, Expired, Cancelled, Rejected, Errored, etc.)

- Signing party's state (Waiting for Signature, Signed, Signed at the Office, Rejected, Rejected at the Office, etc.)

The collected data gives insight to the stakeholders e.g. about the following metrics:

- Overall Digital Signature usage
- Are some Business Service types more prone to being cancelled by the clerk or rejected by the customers?
- The usage amounts of different Business Services
- The relative lead times of documents of different Business Services types from creation to completion
- Digital Signature usage in different banks / branches
- Business Service usage vs. customer age / gender
- The average size of attachments per Business Service
- Customers' preference to Digital Signatures vs. traditional signing at the bank office (Signed vs. Signed at the Office / Rejected vs. Rejected at the Office)

ITIL's Knowledge Management process includes the DIKW hierarchy for representing the relationship between **D**ata, **I**nformation, **K**nowledge and **W**isdom. (Rance, 2011.) Here the data is the raw values that each Digital Signature process stores in the operational database. Information is the structured analytics data available to the Process Owner &co. Knowledge is e.g. the expert insight of the persons analysing the data that makes it usable as a basis for improving the solution. Wisdom is how the knowledge found in the previous step is applied and implemented.

The analytics data has been the source for several change requests on the Business Services model and the underlying Digital Signature solution as well. These changes include e.g.:

- Reminder messages to the customers if they have not signed the document e.g. a week before expiration
- Standard attachments which are automatically included to a new document from Codeserver. These include e.g. Terms of Service documents. If the terms of service change, the Codeserver administrator uploads a new version of the terms. After that each newly created document will automatically attach the new terms.
- A check that at least one of the attached pdf files includes the recipient's SSN. This mitigates the possibility of sending the recipient wrong customer's contract

details. The check results in a warning message but does not prevent the clerk from sending the document.

5.3 Customer experiences

Actual error situations in the Digital Signature solutions are rare as the solution has significantly matured since its inception. An actual error situation is an incident which either prevents clerks from creating and sending documents or prevents the customers from signing or rejecting them. During 2018 there have been three major incidents which were of such level that clerks had to re-create more than 10 lost documents. Incidents on the customer side, in the DSS, have an effect on a far wider group of people but almost never result in the loss of data. A failed signing due to a system error can in almost all circumstances be attempted again after restoration of service.

Problems with e.g. archiving the signed documents to the content management system do not have an impact on the actual signing process and do not directly inconvenience the users, unless prolonged. They are always solved “behind the scenes”.

By far the most common customer-side incident has been that they did not complete the signing process while believing they had done so. Digitally signing a document requires several authentication steps and in almost all cases the customers had clicked the OK button in the solution and left, believing that was it, thus missing the final authentication step which forwards them to enter their TUPAS credentials one more time.

The second most common cause for incidents on the customer side are various browser-related problems. On the bank clerk side, Internet Explorer v11 (IE11) and Edge are the mandated browsers for using the DS-App. On the customer side, any desktop or mobile browser can be used to access the DSS, even though the solution officially supports only IE/Edge, Firefox, Chrome and Safari, and only their latest three versions at any current time.

The incidents the bank clerks encounter are most often human-related issues, the most common being:

- The clerk is authorized to send documents using the representation of several banks / branch offices and they had forgotten to change the representation between documents.
- Incorrect or missing email addresses for notifications to a) themselves b) the customers.

The one outstanding benefit from using the Digital Signature solution for both the bank clerks and customers is that they can use the solution basically anytime and anywhere provided that they have a working internet connection (and in the case of bank clerks, a working VPN connection to the Bank's network). The DS-Application is strictly "desktop only" (i.e. it can be used only with an authorized workstation provided by the Bank), but since 2017 the DSS for customers has supported mobile devices and has also been integrated to the Bank's mobile banking app.

Mobile support in the DSS is the single most important feature in the Digital Signature solution which has been added to it based in a large part on customer feedback and wishes. Bank clerks can send their wishes and requests for changes through the Bank's internal communication channels. The customers can do the same using the Bank's customer portal. Their voices have been and are being heard.

6 Conclusions

Heraclitus of Ephesus, a pre-Socratic Greek philosopher, famously said “No man ever steps in the same river twice”, meaning that change is the fundamental essence of the universe.

Digital Banking, including contract signing through Digital Signatures, has changed the banking business and financial sector in many ways.

The number of bank offices has diminished significantly since people don't need to visit the bank in person anymore to e.g. get the terms of their mortgage altered. The environmental impact is also considerable as less and less paper needs to be pushed around and mailed back and forth.

The customers can browse through contracts and other documents sent to them at their leisure and can accept or reject them basically wherever and whenever; they are not tied to the locations and business hours of bank offices.

ITIL, as a framework and best practices for IT Service Management, scales well and is perfectly applicable for framing the Business Service lifecycle in the Digital Signature solution. Strategy, Design, Transition, Operation and Continual Improvement are all integral parts in the lifecycle management for Business Services.

The scope and usage of the Bank's Digital Signature solution has seen constant growth since the early proof-of-concept stages. Change request and enhancement ideas from the customers, bank clerks, business personnel and the vendor, Avaintec Oy has made the solution, and the Business Services within the solution, and indispensable part of the contract management business. It is estimated that over 500000 digital signatures will be processed by the Digital Signature solution in 2018 at a rate of approx. 35000 processes per month during the second half of 2018. When the solution became commonly available in January 2016, the tally for the first month of production usage was less than 300 signatures, approx. 46500 for the first full year.

New Business Services are constantly being added to the solution. The current portfolio ranges from card applications to mortgage agreements, from changes to loan terms to insurance savings and from corporate documents to new account openings. Obsolete services have also been retired, the ones which have seen this fate have all been available for a specific occasion and a limited duration only.

The research methods used in this study, data collection and interviews, supported each other well. The collected data showed interesting characteristics which the interviewees were able to comment and elaborate upon. Processing it through the DIKW hierarchy resulted in some valuable insights for both the author of this study and the interviewed experts. It is safe to say that all parties benefited from the results of this study.

Why this topic? I have been involved with digital signatures in a professional capacity for a few years and been somewhat involved with the development of the Bank's solution. As a developer I had felt moderately frustrated for lacking the insights and understanding about what lie beyond the small part I had been working on. This study gave me the perfect opportunity to broaden my knowledge about what happens "behind the curtains" from the business perspective.

What about the main research question? It was initially very hard to come up with a single, all-encompassing research question which would cover the whole topic and within a sentence lay out what this study would be about. I originally started with four questions which eventually ended up, slightly modified, as the sub-topics mentioned in chapter 1.3. Did I manage to unearth the foundations of the processes behind Business Services adoption and document their lifecycle within a Digital Signature solution? I have certainly come through this process with a wide and deep understanding of digital signatures in general and especially of service management, whether by ITIL or the IT Standard for Business.

What comes next? I will definitely be looking into the Bank's Digital Signature solution through different spectacles than before. When I will be hearing of a new Business Service having been introduced, I'm fairly certain I cannot but think back to the process of researching for and writing this study.

"Innocence, once lost, can never be regained. Darkness, once gazed upon, can never be lost." – John Milton, Paradise Lost.

References

Biddix, Patrick J. Renn, Kristen A. Roper, Larry D. 2018. Research Methods and Applications for Student Affairs. Jossey-Bass. ISBN-13: 978-1119299707. Chapter 3: "Framing Research".

ITIL Lifecycle Suite. The Stationery Office. 2011 edition.

1. Cannon, David. ITIL Service Strategy. ISBN-13: 978-0113313044
2. Hunnebeck, Lou. ITIL Service Design. ISBN-13: 978-0113313051
3. Rance, Stuart. ITIL Service Transition. ISBN-13: 978-0113313068
4. Steinberg, Randy. ITIL Service Operation. ISBN-13: 978-0113313075
5. Lloyd, Vernon. ITIL Continual Service Improvement. ISBN-13: 978-0113313082

Lazar, Jonathan. Feng, Jinjuan H. Hochheiser, Harry. 2017. Research Methods in Human-Computer Interaction. Morgan Kaufmann. ISBN-13: 978-0128053904. Chapter 8.5: "Interview Strategies".

Mishra, Akash K. 2017. Digital Signature: The Need of Cashless Society. CreateSpace Independent Publishing Platform. ISBN-13: 978-1546382539.

Mintzberg, Henry. 1987. The Strategy Concept I: Five Ps for Strategy. California Management Review, vol. 30, 1. October 1987.

Moeller, Robert R. 2013. Executive's Guide to IT Governance: Improving Systems Processes with Service Management, COBIT, and ITIL. John Wiley & Sons, Incorporated. ISBN-13: 978-1118138618.

Association for Intelligent Information Management (AIIM). 2013. Digital Signatures - making the business case. URL: <https://www.aiim.org/pdfdocuments/MIWP-DigitalSignatures-2013.pdf>. Accessed 30 October 2018.

Avaintec Oy. URL: <https://www.avaintec.com/en/>. Accessed 31 October 2018.

Blanchette, J-F. 2006. The digital signature dilemma. URL: http://www.interpares.org/display_file.cfm?doc=ip1_dissemination_jar-pp_blanchette_annals_telecommunications_61_2006.pdf. Accessed 29 October 2018.

Harris, John B. 2017. 7 Rules For E-Signature Legality And Compliance: Part 1. URL: <https://www.signix.com/blog/bid/109117/7-rules-for-e-signature-legality-and-compliance-part-1>. Accessed 29 October 2018.

IT Standard for Business – A Model for Business-driven IT Management. URL: <https://www.itforbusiness.org/>. Accessed 31 October 2018.

Regulation (EU) No 910/2014 (electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC). URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910&from=EN>. Accessed 31 October 2018.

SIGNiX Blog. 2017. Infographic: The History of Digital Signature Technology. URL: <https://www.signix.com/blog/bid/108804/infographic-the-history-of-digital-signature-technology>. Accessed 28 October 2018.

Statistics Market Research Consulting. Digital Signature – Global Market Outlook (2016-2022). URL: <http://www.strategymrc.com/report/digital-signature-market>. Accessed 29 October 2018.

Subramanya, S.R. & Byung, K. Yi. 2006. Digital Signatures. URL: <https://www.cse.unr.edu/~bebis/CS477/Papers/DigitalSignatures.pdf>. Accessed 29 October 2018.

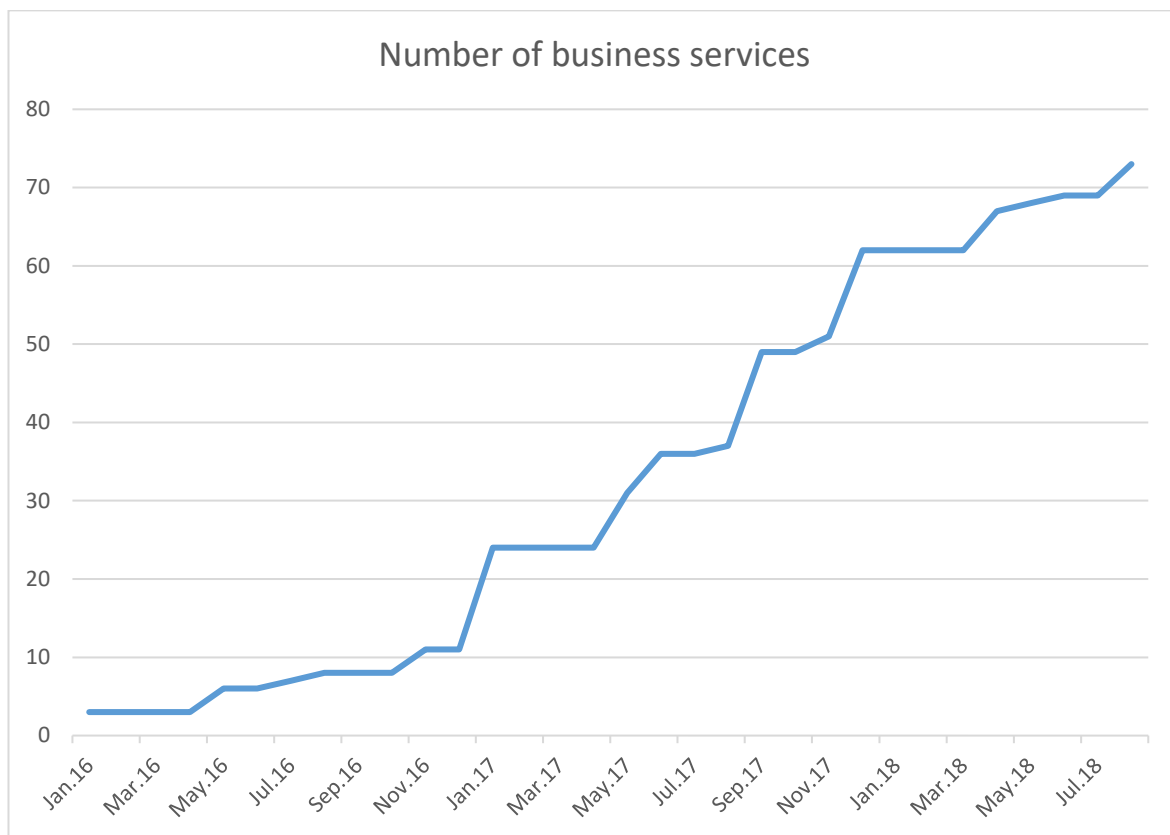
UKEssays. 2017. A History of Digital Signatures. URL: <https://www.ukessays.com/essays/communications/history-of-digital-signatures-communications-essay.php>. Accessed 28 October 2018.

Wikipedia. Digital signature. URL: https://en.wikipedia.org/wiki/Digital_signature. Accessed 28 October 2018.

Wikipedia. ITIL. URL: <https://en.wikipedia.org/wiki/ITIL>. Accessed 28 October 2018

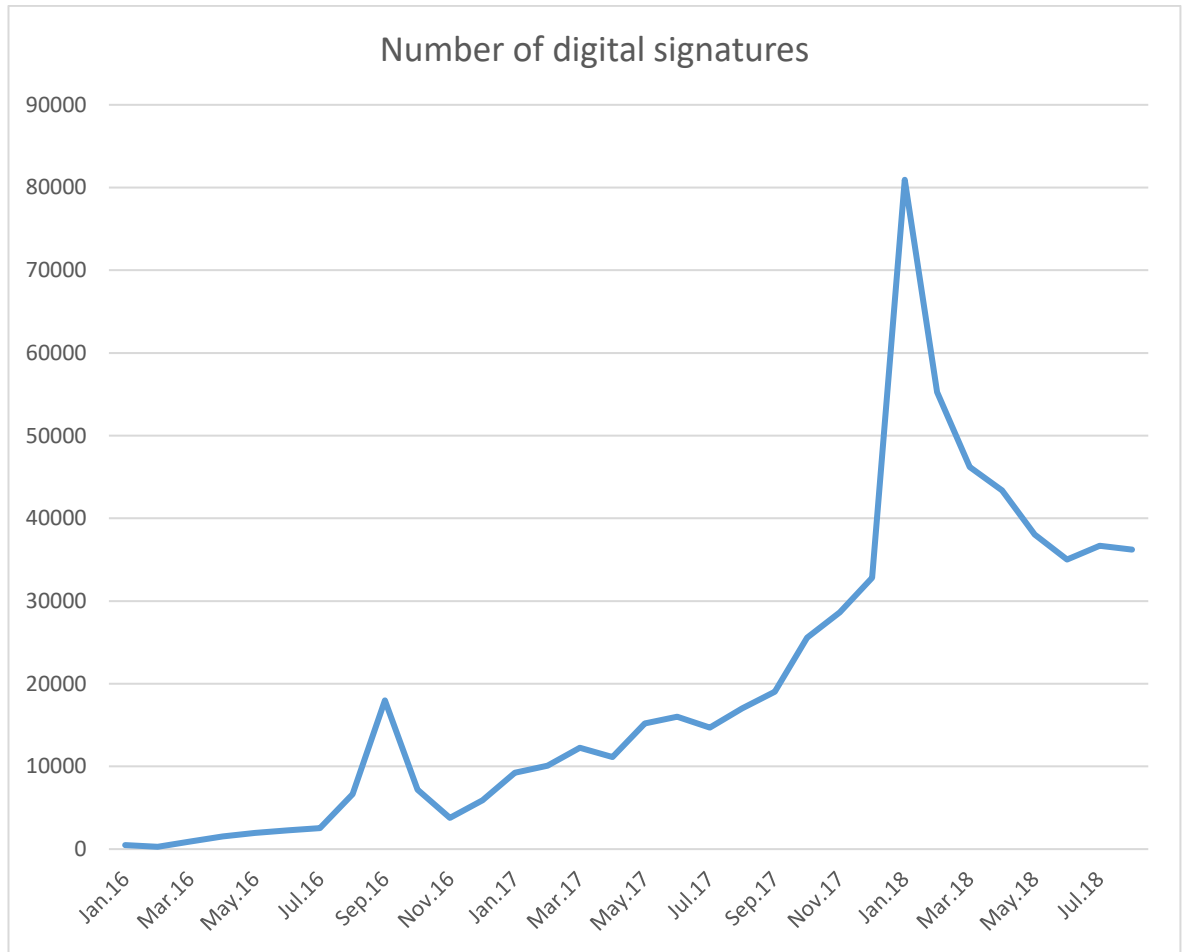
Appendices

Appendix 1. Business Services utilising the Digital Signature solution



- Business services in production 31.1.2016: **3**.
- Business services in production 31.8.2018: **74**.
- Business services in production 31.12.2018 (estimate): **~100**.

Appendix 2. Digital Signature transactions in the Digital Signature solution



- Digital signature processes 1.1.2016 – 31.1.2016: **281**.
- Digital signature processes 1.8.2018 – 31.8.2018: **36228**.
- Linear growth / month Jan 2016 – Aug 2018: **17%**.

Yearly totals:

Year	Digital Signatures
2016	46493
2017	211709
2018 (Jan - Aug)	371669
2018 (Jan - Dec, estimate)	515000

Appendix 3. Interviewees

Name	Company	Role
Pekka Kuosmanen	Avaintec Oy	CEO
N.N.	Avaintec Oy	Project Manager, the Digital Signature solution
N.N.	Avaintec Oy	Lead Architect, the Digital Signature solution
N.N.	The Bank	Process Owner, Digital Signatures
N.N.	The Bank	Service Owner, the Digital Signature solution
N.N.	The Bank	Process Practitioner. Codeserver Administrator for the Digital Signature solution

Appendix 4. Interview questions

1. Service Lifecycle management:

- Where do new Business Services come from? Which party initializes them? Who started the process for adding e.g. the “Mortgage” service to the Digital Signature solution?
- Is there a “surplus” of new Business Service candidates? Does some party weed out the non-viable Business Service types in the service portfolio funnel/pipeline? Which party ultimately decides which Business Services are included in the Digital Signature Solution?
- What is the transit process for retiring a Business Service?
- Where are the Codeserver parameters for Business Services received from, especially those related to the content management system?
- What are the main KPIs that are being measured? How is the data collected / reported? How do they affect service strategy and design?

2. Using Digital Signatures in banking business:

- What are the main business benefits of using a Digital Signature solution vs. traditional methods?
- What are the main benefits for bank clerks? How is it communicated to the clerks that they will soon need to start using the Digital Signature solution since their work flow is related to a Business Service soon to be introduced?
- What kind of customer feedback has the Digital Signature solution received? Has feedback had an effect on the architecture or features?