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State of Public ICT Procurement in Finland

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Abstract: In this master's thesis, the aim is to examine *what is the state of Finnish ICT procurement in 2022*. The research question is examined through EA and tendering. The Scopus database is the source for the ICT procurement and EA literature findings. The research method is qualitative with semi-structured interviews and a grounded theory approach. Five public agencies and seven interviewees participated in the study. Four-stage EA maturity theory helps to categorize the characteristics of the public agencies and examine their agility in the market. As a result of this master's thesis, the implication to practice is to establish decentralized project management practices in public agencies and aim to sum up the software lifespan needs in one tender whenever sensible. Furthermore, interviews result in findings where public procurement practices are standardized; EA maturity evolution increases agility in the public agency; different interpretations on Act on Public Procurement and Concession Contracts (2016) lead to overcareful practices in vendor selection, and finally, it may cause unnecessary vendor changes. In future work, leadership, project management practices, vendor relationships, and the post-tender phase in public agencies need closer examination.

Keywords: ICT procurement, procurement practices, enterprise architecture, enterprise architecture maturity theories, public sector, public agency

Suomenkielinen tiivistelmä: Tässä pro gradu -tutkielmassa tutkitaan *ICT-hankintojen nykyti-*

laa Suomen julkisella sektorilla 2022. Tutkimuskysymystä tarkastellaan kokonaisarkkitehtuurin ja kilpailutuksen näkökulmista. Scopus-tietokanta toimii lähteenä ICT-hankinta- ja kokonaisarkkitehtuurilöydöksille. Tutkielman tutkimusmenetelmä on kvalitatiivinen puolistrukturoituine haastatteluineen sekä selittävän otteensa vuoksi. Tutkimukseen osallistui viisi julkisorganisaatiota, ja niistä seitsemän haastateltavaa. Nelivaiheinen kokonaisarkkitehtuurin kypsyysteoria toimii julkisorganisaatioiden ominaisuuksien ja ketteryyden arvioinnin viitekehyksenä. Täman pro gradu -tutkielman tuloksena syntyy muutamia ehdotuksia julkisorganisaatioiden toimintatapoihin. Julkisorganisaatiot voisivat hyötyä hajautettujen projektinhallinnan toimintatapojen käyttöönotosta, ja yhteen kilpailutukseen tulisi huomioida kaikki ohjelmiston elinkaaren tarpeet aina kun se on järkevää. Haastatteluissa tuli ilmi, että Suomen julkisorganisaatioilla käyttävät hankintayksiköitä tai -tiimejä, jotka yhtenäistävät kilpailutuskäytäntöjä; kokonaisarkkitehtuurin kypsyyskehitys lisää julkisen ketteryyttä; hankintalain erilaiset tulkinnat johtavat liialliseen varovaisuuteen toimittajan valinnassa, ja hankintalaki voi aiheuttaa tarpeettomia toimittajamuutoksia kilpailutuksen jälkeen sopimusvaiheessa. Tulevaisuuden tutkimuksen tulisi keskittyä julkisorganisaatioiden johtamiseen, projektinhallinnan käytäntöihin, toimittajasuhteisiin sekä kilpailutuksen jälkeiseen sopimuskauden erityispiirteisiin.

Avainsanat: ICT-hankinta, kilpailutuskäytännöt, kokonaisarkkitehtuuri, kypsyysteoriat, julkinen sektori, julkisorganisaatio

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1 Introduction

Public agencies spend through public procurement in a regulated environment. Purchasing, negotiations, and receiving the best value for money are demanding while restoring prosperous relationships. Public agencies' tradition and customary course of action in stakeholder relationships are rooted well. Furthermore, public agencies form vendor-relationships through public procurement into pre-tender, tender and post-tender phases. The rigidness of the regulation is one of the issues in public procurement. However, Seppänen, Penttinen, and Pulkkinen (2018) see that the nature of public organizations with various functions, domains, platforms, and stakeholders is a source of complexity.

The Pareto principle states that 80% of the consequences come from 20% of the causes (Newman 2005). The same applies to public procurement vendor relationships in Finland, even if the ratio is more dramatic than 80/20. The balance is steep 95/5, which means that five percent of these vendors produce 95% of the whole ICT sector procurement's worth. The Finnish government used 1,1 billion euros in ICT procurement in 2021 ("Explore Public Spending" 2022), and at the same time, 50% of ICT procurement projects fail ("Tietojär-jestelmien hankinta Suomessa 2013" 2013). In theory, the uneven distribution of 95/5 means that 1 billion euro ICT procurement annually is created by 87 vendors; the remaining 0,1 billion euros distributes to 1745 vendors ("Explore Public Spending" 2022). Furthermore, all of the vendors in the top 5% are large companies with a turnover of +50 M€ a year. In the European Union, the aim is to support small and medium-sized vendors to participate in public procurement (2014/24/EU 2014; Celotti et al. 2021), which raises attention to the high number of large vendors in Finland's ICT procurement field.

In Finland, the public discussion focuses on the upcoming social welfare reform, healthcare, and rescue services. On 1st of January 2023, wellbeing services counties will be responsible for providing the services mentioned above to their citizens (*Health and Social Services Reform* 2022). The reform changes the organizing, production, and funding of social welfare, healthcare, and rescue services. The wellbeing service counties receive universal-basis funding from the government, which means that the funding does not target anything specific, and the counties have the flexibility to use the funding to provide services. The reason for

the reform is to inhibit the increase in costs and ensure equality in wellbeing services. However, the wellbeing service county reform challenges information management integration and cost-effectiveness. Ministry of Finance has established the in-house company DigiFinland which has a central role in wellbeing service county reform to help the counties in their legislative tasks. Ministry of Social Affairs and Health, the Ministry of the Interior, and the Public Sector ICT Department of the Ministry of Finance finance DigiFinland 2021-2023 (*Health and Social Services Reform* 2022). Public agencies may purchase from in-house companies without public procurement practices. The reform changes the familiar structures; ICT-wise and organizationally the demand is massive.

However, to observe aforementioned change in the market, the literature offers guidance. In information systems (IS) literature, the shared belief is that organization's IT, business and strategy should be aligned. Berg et al. (2019) depict that top-quadrille organizations in the world have mature EA, and consider IT alignment as a building block for mature EA and agile operations. Furthermore, Ross, Weill, and Robertson (2006) depict that EA maturity enhances agile operations in the organization and helps to react to market changes.

This thesis examines the state of ICT procurement in the Finnish public sector. The perspective limits the EA and tendering, and how these may or may not affiliate agility to react to the market. ICT procurement is intriguing because it is one way to execute strategy in public agencies. Therefore, in this study, seven semi-structured interviews are performed in five public agencies.

Chapter 2 examines the background; ICT procurement, suppliers in the procurement, and EA themes. Chapter 3 describes the research method and the methods for analyzing the results. Chapter 4 dives into the results - the EA maturity stages of the different agencies and the special characteristics of public procurement. Chapter 5 provides an extended discussion of results. Finally, Chapter 6 provides some final conclusions.

2 Background

This chapter presents literature and legislation background in ICT procurement and national EA. In Section 2.1, the ICT procurement characteristics are described in detail. In Section 2.2, three types of supplier relationships in public procurement are presented. In Section 2.3, EA literature and legislation characteristics are described, and finally, in Section 2.4, EA maturity literature with four-stage EA maturity model is described. Themes are selected for this chapter to discover the current state of the ICT procurement field in Finland in literature and legislation. In the EA sections, the perspective is mainly Nordic, which is comprehensible due to regulated national EA in many countries.

2.1 ICT Procurement

In many cases, public agencies and ICT vendors form thriving, long-lasting collaboration (Kautonen and Nieminen 2019). However, the rising ICT costs, digitalization that matter, and the policymakers' target to lower the costs and aim to enhance the quality is a challenging premise. Public procurement follows the mandated course of action with its procedures and evaluation criteria and aims for the best value for money. Regulated public procurement procedure targets undifferentiated and non-discriminatory treatment for vendors (Holma et al. 2020).

At the same time, ICT procurement projects tend to exceed original schedules and budgets, and systems may collapse before the project ends (Hayati, Maharoof, and Burhanuddin 2018). Many issues emerge from under-evaluated project resources, which introduce bottlenecks and prolong the project (Hayati, Maharoof, and Burhanuddin 2018). Tendering is a critical phase and a vital issue in ICT procurement (Kautonen and Nieminen 2019). Inadequate and ambiguous requirement-set analysis for tender requirements cause exceeding in budget and schedule (Hayati, M.A., and Maharoof 2017). Initiation of the procurement process is crucial because it determines the progress and outcomes of the whole procurement (Iloranta and Pajunen-Muhonen 2012). Nuottila, Aaltonen, and Kujala (2016) see that public ICT procurement is challenging because of the public procurement parameters. Strict con-

trol practices and public agencies' current methods harm innovation and cost-effectiveness in public procurement (Baily et al. 2008). Keränen (2017) depicts that EU and national regulations in Finland hinder the effective procurement process.

At the same time, strict parameters in public procurement exist for a reason. The public sector and governments contribute to society and the economy in various ways. In many cases, the government is a buyer for the goods and services, supplier for the services, and regulator (Gunela and William 2013). Public agencies produce the services and infrastructure which are prerequisites to preserve social and economic structures in the society (Lähdesmäki and Kilkki 2008). In European Union, the worth of public procurement is 14% of its GDP (Pircher 2020). During the last decades, the public procurement environment has experienced notable changes (Torvinen and Ulkuniemi 2016). European Union executed a face-lift for the public procurement directives after the 2007 financial crisis. The public procurement directives are from 2014. Furthermore, the aging of the population and need for efficient services, scarce funding, and the development of new services with technological advancements drive the change (Guzmán and Sierra 2012).

The public sector purchases goods and services for public consumption. The process receives its mandate from EU and national procurement legislation within European Union (2014/24/EU 2014). For the procurement process, EU and national legislation aim to ensure equality, transparency, and relative weights for price and quality (Stilger, Siderius, and Raaij 2017). Public procurement works through a public-private partnership, where the public sector arranges a tender and private tenderer participates (Keränen 2017). Through this mechanism, vendors deliver public services. Even if the current system involves vendors, some studies consider it inflexible (Baily et al. 2008; Nuottila, Aaltonen, and Kujala 2016). In Finland, the public procurement process is mandated, especially in Act on Public Procurement and Concession Contracts (Act on Public Procurement and Concession Contracts 2016), but in practice, nearly thirty laws are involved in the ICT procurement process (Jaana 2020).

Ideally, procurement should help to achieve the best value for money. Stilger, Siderius, and Raaij (2017) identify why effectiveness is important in public procurement. Firstly, public services depend on the inputs from the procurement functions (Stilger, Siderius, and Raaij

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2017). Secondly, procurement may play a vital role in delivering the organization's strategy, resulting in significant monetary savings (Stilger, Siderius, and Raaij 2017). Finally, poor procurement practices or difficulties in following legislation may result in legal ramifications (Stilger, Siderius, and Raaij 2017). In Germany, the national procurement regulation and the mandatory tendering restricts long-term partnerships between public agencies and vendors (Essig and Batran 2005).

To summarize, the views on procurement regulation vary in literature. Other studies emphasize the careful preparations prior to the tender (Kautonen and Nieminen 2019; Hayati, M.A., and Maharoof 2017; Iloranta and Pajunen-Muhonen 2012), and other studies criticize procurement regulation to be strict, which hinders the innovation (Baily et al. 2008), effectiveness (Baily et al. 2008; Keränen 2017) and the formation of sustainable partnerships (Essig and Batran 2005).

Public procurement has three phases pre-tender, tender and post-tender (Holma et al. 2020; Patrucco, Luzzini, and Ronchi 2017; Holma and Sammalmaa 2018). Weele (2018) recognizes six phases – specification of needs, vendor selection, conclusion of contracts, ordering, expediting, and lastly evaluation and follow-up. These phases in Weele (2018) are same as public procurement tasks in Holma et al. (2020), Patrucco, Luzzini, and Ronchi (2017), and Holma and Sammalmaa (2018). This thesis focuses on the pre-tender, tender and post tender phases.

In the pre-tender phase, the public agency evaluates the need to initiate the procurement and decides procurement procedure to use (Holma et al. 2020). Open and restricted procedures are the most used in Finland (Holma et al. 2020). In European Union, open procedure in the most frequently used (*Public tendering rules* 2022). In an open procedure, every vendor may participate, but in a restricted procedure, only pre-selected vendors may submit tenders (*Public tendering rules* 2022; Holma and Sammalmaa 2018). These procedures do not allow participants to communicate during the tender phase, which means that the tender must be prepared with precision (Holma et al. 2020). The competitive negotiated procedure allows the tenders from pre-selected vendors, who may submit an initial tender and then join the negotiations (*Public tendering rules* 2022).

The competitive negotiated procedure has three restrictions in the Act on Public Procurement and Concession Contracts (2016). The public agencies and vendors are not allowed to negotiate the minimum criteria, the grounds for the most advantageous tender, and the price and quality criteria during the procedure (Holma et al. 2020). In a competitive dialogue, public agencies and vendors may discuss all the aspects of the procurement. Innovation partnership is the adequate procedure when the wanted product does not exist in the market, and pre-selected vendors may participate in it (*Public tendering rules* 2022). In a competitive negotiated procedure, competitive dialogue, and innovation partnership, communication is allowed during the tender phase. These procedures have different phases where the public agency may further define the solution's requirements in cooperation with the vendors. However, restrictions from Act on Public Procurement and Concession Contracts (2016) emphasize the public agency's responsibility to prepare and define the procurement's subject matter before publishing the call for tenders.

The public agency needs to ensure equitable treatment between the participating vendor, and one way mentioned in the Act on Public Procurement and Concession Contracts (2016) is to deliver the information gathered in the pre-tender phase and the information gathered in the tender phase to all participants. However, Act on Public Procurement and Concession Contracts (2016) does not define exact methods for communication in the pre-tender phase, why the public agency interprets the law to arrange equitable and non-discriminating market dialogue with the vendors.

The public agency initiates the tender phase with a public call for tenders (Kautonen and Nieminen 2019; Holma et al. 2020). In Finland, the Hilma online service is a platform for the tenders (Holma et al. 2020). Public Procurement Directive 2014/24/EU (2014) mandates that the submission of tenders is supposed to be electronic. However, the rule can deviate if the matter is discreet, and ensuring safe submission is not guaranteed (Act on Public Procurement and Concession Contracts 2016).

In an open procedure, the call for tenders means that the vendors may send bids, and in restricted procedure and negotiation procedures, the call for tenders is the notice to apply in the bidding. In an open procedure, the tender period is a minimum of 35 days, and in negotiating procedures, 30 days (Act on Public Procurement and Concession Contracts

2016). The public agency is obligated to set the call for tender and all the documents related to the tender from the day the call for tender is published (Act on Public Procurement and Concession Contracts 2016). Usually, vendors may ask questions during the tender phase, and the public agency may answer the questions equitable and non-discriminating manner (Holma et al. 2020). The call for tender can be modified and corrected with a good reason and in a way that does not essentially change the original call for tender (Iloranta and Pajunen-Muhonen 2012). The tender phase ends with the vendor selection.

The post-tender phase begins with an official procurement contract (Holma et al. 2020). The post-tender phase is not mandated in the Act on Public Procurement and Concession Contracts (2016), but some of its' principles affect the contract period. The post-tender contract is a civil law contract, meaning neither buyer nor supplier can change the contract during the contract period (Holma et al. 2020; Act on Public Procurement and Concession Contracts 2016). Act on Public Procurement and Concession Contracts (2016) obligates the public agency to arrange new procurement if the changes are essential. If the public agency anticipates the change in the tender phase and adds a change condition into the procurement documents, new procurement is not necessarily needed (Act on Public Procurement and Concession Contracts 2016). However, the condition must be clear, exact, and unambiguous (Holma et al. 2020).

2.2   Suppliers in Public Procurement

In this section, the goal is to describe the public procurement' suppliers. The purpose is to open up the view of who participates in public procurement and what might be the advantages and disadvantages for the different actors. In this thesis, three kinds of supplier relationships take place.

As a first type, public agencies can prepare the procurement with a consulting vendor before procurement. The cooperation aims to build a coherent view of the market, inform the market about the upcoming procurement, and communicate the requirements for participating vendors. Cooperation is vital to plan and execute the procurement in a way that does not violate the nondiscrimination and transparency principles (2014/24/EU 2014).

The second type is the supplier relationship which forms through public procurement, and legislation mandates it, Act on Public Procurement and Concession Contracts (2016) as an example. This relationship enfolds all vendors who participate in public procurement.

The third relationship receives less attention in this thesis but is essential to place on the public agencies' supplier map. Public agencies have an option to buy in-house, which is not in the circle of Act on Public Procurement and Concession Contracts (2016). In-house procurement is an interesting way to buy software and services because the buyer or procurement unit does not need to follow procurement procedures in in-house procurement, which is a significant derogation to the Act on Public Procurement and Concession Contracts (2016). There are a few requirements for the in-house unit - it needs to be owned by different procurement units and may not have funds from outside sources. However, the in-house unit may have a five percent or a maximum of 500 000 € business outside the procurement units (Act on Public Procurement and Concession Contracts 2016). However, the limit for outside business is ten percent, and the 500 000 € restriction evaporates if the market cannot provide the needed service (Act on Public Procurement and Concession Contracts 2016).

Public Procurement Directive 2014/24/EU (2014) aims to enhance small and medium-sized vendors' participation in public procurement. The aim is to facilitate economic recovery in times of crisis and help SMEs grow. The economic recovery links tightly to market growth - the more vendors are in the market, the more employment rates rise.

The European enterprises are classified through the number of employees, turnover, and annual balance sheet. European Union small and medium-sized enterprises (SME) have less than 250 employees, their annual turnover is not above 50 million, and their annual balance sheet is not more than 43 million (Ancarani et al. 2019).

A study within European Union (Celotti et al. 2021) maps out the current situation of SMEs in public procurement and reveals that there are many hinders to SMEs from participating in public procurement. Nearly 48,5% of the SMEs in the study did not have access to public procurement, and 58,2% of those were not interested in participating in the future because public procurement is too complicated. In Celotti et al. 2021 study, almost 30% of the participants would need an expert's support to tender, and smaller enterprises – and

especially micro-enterprises – experience more constraints when participating in tendering than medium-sized enterprises. Micro enterprises also had a lower succeeding percentage in public procurement 82,5%, whereas, for middle-sized enterprises, the succeeding percentage was 89,7% (Celotti et al. 2021). Overall, SMEs that had not participated in public procurement had less knowledge of public procurement principles compared to the SMEs which took part in tendering (Celotti et al. 2021).

Ancarani et al. (2019) find similar results - SMEs lack information on procurement processes, and cross-border tendering is not standard within the EU. One of the most surprising – to the author's opinion – was that in high knowledge-intensive sectors, which were mainly ICT in the study, 20% of enterprises perceive public procurement as complicated, and they have little knowledge of the disciplines in the tendering process (Celotti et al. 2021). Ancarani et al. 2019 find that the small size of the business, number of years in the field, and a low headcount may hinder participating procurement. Public agencies have long payment periods (Iskola and Rindell 2020), which may be one of the root causes for the hinders to participation in public procurement, and the other one might relate to the slow nature of public procurement. Therefore, despite the aim in 2014/24/EU (2014) large vendors benefit from the market. In Finland, 95% of the ICT procurement's worth distributes to large vendors.

2.3 Enterprise Architecture in Public Agencies

Next, we examine EA in the public sector literature- and legislation-wise. For Finland, a certain level of national EA is mandatory, and recommendation JHS179 (*JHS 179 Kokonais-arkkitehtuurin suunnittelu ja kehittäminen* 2017) describes the EA needs in detail. JHS179 has roots in the Open Group Architecture (TOGAF). TOGAF is the most widely used EA framework (Cameron and McMillan 2013). The problem is that even if TOGAF is well recognized and widely used, it has not been adopted thoroughly. Furthermore, TOGAF's practical implications remain unknown because it lacks research (Kotusev 2019).

Kotusev (2018) and Alm and Wißotzki (2013) criticise TOGAF in practise. Kotusev (2018) sums up that the TOGAF practises in use do not resemble TOGAF framework, and Alm and Wißotzki (2013) depict that TOGAF is expensive to establish. Even though TOGAF receives

critique and has not been researched in practice, the Open Group promises TOGAF to be the most reliable and proven EA framework (*The TOGAF® Standard, 10th Edition* 2013). However, until 2018 Kotusev (2018) the researched proof on TOGAF framework usefulness in practise was almost non-existent (Alm and Wißotzki 2013). Literature published since, yet again critiques TOGAF (Kotusev 2018, 2019; Alm and Wißotzki 2013). Therefore, in this thesis, the approach is to examine the other promising EA frameworks in practice. Ross, Weill, and Robertson (2006) have EA framework, which has been studied extensively in practice. However, it is not widely recognized. Other promising frameworks according to Kotusev (2019) are the Business Capability framework because it has formed through the practice and Mosaic EA according Setälä, Abrahamsson, and Mikkonen (2021) because it executes the current legislative tasks in the name of interoperability and data availability.

Current legislation differs from its ancestors because the EA term is not in use (Act on Information Management in Public Administration September 8, 2019). However, the content regarding EA is the same even if open data directive generated additions to it such as information pools and machine-readable information format. Current legislation (Act on Information Management in Public Administration September 8, 2019) uses descriptive approach on the EA. The legislation regulates, that public agency's information management model should be:

> *"maintained to design and implement the management of services, consideration, and datasets, to implement the rights and restrictions relating to access to information, to decrease multiple collections of information, to implement the information systems and information pools, and to maintain information security"* (Act on Information Management in Public Administration September 8, 2019).

Within the European Union, the first edition of Directive on The Re-use of Public Sector Information in 2003 (PSI Directive) (*Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information* 2003) initiated legislation in Finland. Act on the Direction of Public IT Governance was published in 2006 (HE 246/2010 vp 2010). Public sector organizations in Finland have begun to familiarize themselves with EA, and the public agencies drew statements that describe the

current state of EA in the organization (Lemmetti and Pekkola 2012). EA is a systematic method to describe, manage and develop an organization's processes, information resources, and information systems. Act on the Direction of Public IT Governance in 2006, and 2011 (*FINLEX ® - Säädökset alkuperäisinä: Laki Julkisen Hallinnon tiedonhallinnasta 906/2019* 2011) mandate EA in public agencies. Therefore, the literature describing the practices defined in the Directive on Open Data and The Re-use of Public Sector Information (European Parliament 2019) (later Open Data Directive) still travels with the term EA.

The open data directive (European Parliament 2019) mandates public agencies in the member states to provide documents for re-use in machine-readable, online discoverable, and interoperable format. In other words, policymakers aim to enhance productivity and standards of service systems with reusable and linking information systems (Lemmetti and Pekkola 2012; Seppänen, Penttinen, and Pulkkinen 2018). The Act on Information Management in Public Administration describes the new premises in Finland (Act on Information Management in Public Administration September 8, 2019). The legislation highlights essential areas to control in the agencies. Ross, Weill, and Robertson (2006) recon that EA should act as an organization's strategy which can evolve and aim for agility.

However, literature implicates that enterprise adoption rates are low in public agencies (Seppänen, Penttinen, and Pulkkinen 2018; Syynimaa 2017). The public agency builds on heterogeneous organizations, which often have separate and different business functions and information systems. As a result, the public agency EA has numerous stakeholders, platforms, and organizations, increasing complexity (Seppänen, Penttinen, and Pulkkinen 2018). Seppänen, Penttinen, and Pulkkinen (2018) identify key issues in EA adoption in the public sector, which are further described in categories *resistance towards EA*, *relevant EA goals*, and *EA practices in use*. The next subsections outline how EA in public agencies appears in literature. The section receives a skeleton for the issues from Seppänen, Penttinen, and Pulkkinen (2018) research, and it is filled with new EA artifacts presented in the literature. EA artifacts are bits and pieces which form EA (Kotusev 2019; Niemi and Pekkola 2017). These artifacts are described more thoroughly in the following.

Lemmetti and Pekkola (2012) underline that in public agencies, EA can be an actual structure the ICT forms or a collection of models that depict the structure. In the first option,

the assumption the EA exists, whether it is modeled or not, and the ladder focuses on the descriptions of how EA is conceptualized (Lemmetti and Pekkola 2012). The confusion is remarkable because both assumptions use the same phrasing. Seppänen, Penttinen, and Pulkkinen (2018) conclude that little shared vocabulary, similarly to Lemmetti (2016) and Syynimaa (2017) confusion in EA concepts and lack of EA understanding hinder EA practices and receiving the EA benefits.

Furthermore, outside the IT domain, public agency stakeholder groups fail to adopt EA artifacts in practice (Seppänen, Penttinen, and Pulkkinen 2018; Nurmi, Penttinen, and Seppänen 2019). Public sector software sustainability issues can be overcome with EA where different services and vendors can quickly deploy and integrate into the ecosystem environment (Setälä, Abrahamsson, and Mikkonen 2021). Nurmi, Penttinen, and Seppänen (2019) research on 26 practitioners in public agency reveal that ecosystem thinking in EA software is missing and needed. An ecosystem, where every piece gives something, may be achieved with services that interact via well-defined APIs but with no direct access to other services (Setälä, Abrahamsson, and Mikkonen 2021). Techniques in the system need to support systematic and fast development and deployment (Setälä, Abrahamsson, and Mikkonen 2021).

Public sector software suffers from vendor lock-in, high maintenance costs, and time-consuming and error-prone public tendering. In addition, need-based user utilization, co-creation, holistic view, and organizational capabilities are essential building blocks for public EA (Nurmi, Penttinen, and Seppänen 2019). Modular business units (Setälä, Abrahamsson, and Mikkonen 2021) attached to the organization's core infrastructure help in this regard. Setälä, Abrahamsson, and Mikkonen (2021) present mosaic EA, where the different business units form an ecosystem without giving up the business units' strategical purpose. Seppänen, Penttinen, and Pulkkinen (2018) sum that the EA benefits are difficult to predict because most of the results are intangible, indirect, or strategic. Setälä, Abrahamsson, and Mikkonen (2021) recon that the legacy system is demanding and expensive to replace, but it is a necessity in the end.

Seppänen, Penttinen, and Pulkkinen (2018), Dang and Pekkola (2017), Larsson (2011), Hjort-Madsen (2006), and Valtonen (2017) state that EA management should be in line and guided with the strategic objectives of the organization. Svärd (2010) summarizes that

successful EA in public agencies requires organization and unit overarching strategic management. Furthermore, in the fragmentation or silo structure with non-interrelated systems, data, and processes, the lack of shared business objectives diminishes the shared economic and political incentives to cooperate with other public agencies (Hjort-Madsen 2006). On the opposite, Syynimaa (2019) research on regional municipalities' ICT cooperation in Finland shows that aligned networking technology and systems exist, even if the business architecture layer is different for the cooperating public sectors. One public agency might focus on education and the other on healthcare, and the standardized systems enhance cooperation.

EA is a scapegoat for an organization's hidden problems where new management conflicts with previous management (Ylinen and Pekkola 2018). Research (Ylinen and Pekkola 2018) reveals that the public organization's IT department's role is ambiguous (Larsson 2011) and has four causes. IT department lacks objectives, focus, commitment, and similarly with Seppänen, Penttinen, and Pulkkinen (2018) EA work management. Hence, EA raises hidden tensions between the IT department and IT (Ylinen and Pekkola 2018; Seppänen, Penttinen, and Pulkkinen 2018).

The top-management issues haunt hidden behind the problems mentioned above. The EA lacks top-management sponsorship (Seppänen, Penttinen, and Pulkkinen 2018; Seppänen, Heikkilä, and Liimatainen 2009; Hjort-Madsen 2006), which is crucial if the organization wants to receive the EA benefits such as cost reduction, IT standardization, process enhancement, and strategic differentiation (Syynimaa 2017). The lacking leadership hinders EA process adoption. Furthermore, Seppänen, Penttinen, and Pulkkinen (2018) recognize that EA practice demands specialized skills and capabilities to manage vast entities. Manager's soft and hard skill-sets enhance EA practices (Seppänen, Penttinen, and Pulkkinen 2018; Guo and Gao 2020; Ajer and Olsen 2018). The leader must have leadership and management skills and an understanding of the technical side of the entity.

EA disrupts public agency's natural order and causes resistance (Seppänen, Penttinen, and Pulkkinen 2018). Conventionally, new arrangements channel through fundamental organizational structures and strict professionalism culture in public agencies (Seppänen, Penttinen, and Pulkkinen 2018). Organization perceives EA deployment as IT-oriented change (Seppänen, Penttinen, and Pulkkinen 2018; Penttinen and Isomäki 2010), where other EA

processes and activities are not visible enough or cause problems (Guo and Gao 2020). A shared characteristic of these problems is that the problems relate to the organization's EA but are not caused by it. Penttinen and Isomäki (2010) find that EA interoperability is more straightforward to develop for state agencies and ministries than for public agencies, such as municipalities, health care, and education. The successful EA case studies in public agencies are crickets, even if many adoption frameworks have been suggested.

2.4 Enterprise Architecture Maturity in Public Agencies

Studies in IT alignment in the organizations has resulted in contradicting outcomes (Bradley et al. 2012; Gerow et al. 2014; Kearns and Lederer 2003; Luftman 2000). Other studies see IT alignment as an enabler for meeting an organization's strategic objectives, whereas others question whether it diminishes productivity. A study by Berg et al. (2019) shows that top-quadrille organizations in the world have mature EA, and see IT alignment as a building block for mature EA and agile operations. Agility and EA maturity are key components for reacting to changes in the market (Ross, Weill, and Robertson 2006).

Bradley et al. (2012) study proves that EA maturity influences the IT resource efficiency when pursuing strategic goals. Finding relies on the considerations where IT planning involves business planning and vice versa, which results in IT decisions becoming more centralized (Bradley et al. 2011). The phenomenon aligns with Ross, Weill, and Robertson (2006) findings, where decision-making becomes increasingly centralized when organizations achieve a higher level of EA maturity.

The following subsections Ross, Weill, and Robertson (2006) EA maturity stages are examined thoroughly and linked to other EA literature if possible. The maturity stages are business silo architecture, standardized technology architecture, optimized core architecture and business modularity architecture.

2.4.1 Business Silo Architecture

In the application silo architecture stage by Ross, Weill, and Robertson (2006) business and IT do not have a relationship. Business strategy does not affect IT solutions, and counter-

wise, IT does not affect business strategy. In public agencies, so-called businesses are legislative-based duties and the services public agencies need to provide for the community. Transaction processing can be centralized in the silo application architecture, even if another infrastructure is rarely shared (Ross, Weill, and Robertson 2006). Otherwise, data management is rare. It consists of multiple platforms, and every system has its separate data (Ross, Weill, and Robertson 2006; Seppänen, Penttinen, and Pulkkinen 2018). EA does not exist in the architecture silo stage - optimization is local, and systems limit to single processes (Ross 2003). As a positive impact, systems achieve full functionality, and managers are usually pleased. However, the application silo systems do not communicate with other systems (Ross 2003; Setälä, Abrahamsson, and Mikkonen 2021). A simple cost-benefit analysis describes the use case, costs, and benefits of funding these systems. The benefits are often predictable and measurable and, on the other hand, exaggerated. Linkages between systems are challenging to establish, and migration costs are high. In the application silo stage, the system is a blessing and a burden. Furthermore, application silos are expensive and difficult to maintain.

2.4.2 Standardized Technology Architecture

The second phase in the Ross (2003) study, standardized technology architecture, states that improvements in IT efficiencies, such as standardized technology and technology management, lead to increased centralization in management. The aim is to look forward to shared practices and infrastructure, reduce platforms, and raise cost-effectiveness. The organization's key benefits may require sacrificing some business unit needs (Ross, Weill, and Robertson 2006; Ross 2003; Rakgoale and Mentz 2016).

The standardized technology architecture stage shares the technology standards throughout the organization. Diminishing systems and platforms with similar functions and vendors is part of standardization. The introduction of data warehouses enables access to data. However, transaction data embeds still in separate systems. Many organizations conceptualize EA in this stage, and the business department is rarely involved in this process. IT efficiency rises and generates savings up to 20% (Ross, Weill, and Robertson 2006). Standardization reduces complexity and increases maintainability, reliability, and security. Seppänen, Pent-

tinen, and Pulkkinen (2018) have observed that public agencies' IT is complex due to the different legislative tasks they need to perform. However, standardization enhances management which is also a known problem for public agencies in Finland (Nurmi, Penttinen, and Seppänen 2019). Standardized technology produced IT departments with shared policies and jostled systems.

The transition occurs from silo architecture to the model where IT shapes business decisions. Fundamental organizational attitudes need rewiring. When the unit searches for new systems, the negotiating happens among accepted systems and platforms rather than defining a tailored solution and aiming for the best in the markets. However, managerial resistance may arise towards standardization. CIO and IT department need senior management or executive level backup for the standardization process that may come as a culture shock (Ross, Weill, and Robertson 2006). Standardization brings new risks to management: the IT department needs to be on the nerve to monitor and upgrade the standards. More profound cost and benefit analyses are needed because business units are unwilling to replace systems that already function as they should. Hence, the complexity of investment decisions rises. Shared infrastructure may cause extended payback periods, and relative value and direct benefits from shared infrastructure are cumbersome to assess. Change is not fast; the commitment to new standards may take up to two years, which is when personnel forgets early conflicts about standardization.

2.4.3 Optimized Core Architecture

The third stage, optimized core architecture, builds on shared technology built in the second stage and provides aligned IT processes tailored to its business model (Ross 2003). Falling in the same category, Bradley et al. (2011) find that EA maturity indirectly impacts an organization's agility via IT alignment. The third stage focuses on data management and EA infrastructure development. Data and applications are shared in the third stage of Ross (2003) four-stage model. IT grey areas, such as overcapacity and duplicity, recognition is a part of the third stage and developing reusable data and process platforms (Ross, Weill, and Robertson 2006). Since the third stage is about widening the scale to consider the whole organization rather than the business unit, resistance toward standardization may rise. Local

management has less power to make decisions.

The core data and processes sets in the spotlight in the optimized core architecture stage (Ross, Weill, and Robertson 2006). Ross (2003) uses the phrase "wired" to describe a situation when the business rules for the organization's core activities and processes connect to the organization's infrastructure. Thus, data rationalization and infrastructure development take place. Data rationalization means that time and mission-critical data is distinguished from the embedded application silo structure to meet the stakeholder needs. The data management tool-set includes data stores and middle-ware for such data, enabling core activities (Ross, Weill, and Robertson 2006). Embedded data is extracted and made available for the core processes which depend on it (Ross, Weill, and Robertson 2006). Infrastructure development means that core processes integrate into infrastructure activities (Ross, Weill, and Robertson 2006). Retaining the integrity of the data is crucial, which usually leads to process standardization (Ross, Weill, and Robertson 2006). When data is reliable, the same input always produces the same outcome. Optimized core processes increase stability, outcomes become predictable, and consistency sets the solid ground for innovation (Ross, Weill, and Robertson 2006).

The optimized core architecture demands cooperation between senior business managers and IT to agree on the core processes and the critical data (Ross, Weill, and Robertson 2006). For optimized core, business rules are rigid, data and processes are managed, and the manager for the entity is in the position of proper authority to maintain processes disciplined and data monitoring. Adding new processes and systems must be disciplined; the architecture must be clear to all in execution and management.

The optimized core architecture implementation holds risks: The recognition of the core. Managers should be able to clearly state the essence of the processes and the critical data for them. Processes should have discipline, and the central organization should be strong. A notable factor is that business unit managers lose some of their power in process standardization. It is a top-down procedure involving cultural change that can overwhelm the organization if it is too fast. When the third stage ends, managers and IT can explain the organization's operating model, what is needed IT-wise and how to implement it (Ross, Weill, and Robertson 2006).

2.4.4 Business Modularity Architecture

The modular architecture stage is strategically agile with its reusable or tailored modules. The top management has control over processes and data. IT management has two options to enhance agility in the modular architecture stage when the wired EA core exists (Ross, Weill, and Robertson 2006). Reusable modules and customer-oriented services in business units raise the organization's agility. Business units can have greater power in local process decisions if the processes wire to the infrastructure core(Ross, Weill, and Robertson 2006). Modules enable customization when standardization and optimized core are intact. Ongoing cooperation between IT and senior management is necessary for modular architecture to take place – both need to be aware of which processes are required and standard and which processes allow local choice within the selection.

EA is an effective way to manage IT assets, align IT investments and requirements in business (Pour and Fallah 2019; Bradley et al. 2011; Kearns and Lederer 2003; Rakgoale and Mentz 2016; Ross, Weill, and Robertson 2006; Berg et al. 2019). High maturity in EA is a prerequisite for agility in an organization (Bradley et al. 2011; Ross, Weill, and Robertson 2006). End of the fourth stage in Ross, Weill, and Robertson (2006) EA maturity model, organization has created reusable modules for business units, enhancing business unit managers to gain back their power by giving them a greater choice to design front-end interfaces. Modularity is essential to link every piece to core data and back-end processes Ross (2003). Agility increases through EA, which builds on modular business unit information systems.

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3 Research Approach

This chapter presents the approach for empirical research - the interview and data analysis methods. In Section 3.1 the research setup is presented to create an understanding of the issue. In Section 3.2, the research question is elaborated. In Section 3.3 the coding and transcribing methods for the empirical data are described.

3.1 Research Setup

In this section the research setup is set. Overall, the market field for ICT procurement seems to be under vast changes. Therefore, in the center of this thesis are Finnish public agencies, procurement practices and the visions which they follow in the ICT procurement. The aim is to interview different kind of public agencies: government owned enterprises, state administrations, cities, and welfare organization. Literature gives input that state administrations and cities adopt EA differently – state administrations are faster and cities are slower. Literature also reveals that EA increases the agility in an organization as well as the higher maturity stages. One parameter to measure agility is the reaction time to market. In public agencies public procurement is the way to purchase and participate in the market. Therefore, different sorts of public agencies are interviewed on their EA adoption and maturity and the procurement practices.

3.2 Research Question

In this section the research question is described. The aim is to find out the state of Finnish ICT procurement. Finnish public agencies must have EA, which for it seems natural to assume, that the strategy to purchase ICT goods and services, shows or is executed with it. Literature supports the assumption, that organizations with higher level of EA maturity are more agile and react to the market faster than the organization with lower EA maturities. Therefore, the to answers the main research questions, the issue is sliced into two sub-questions:

- *What is the state of Finnish ICT procurement?*

  – *What is the state of Finnish ICT procurement with respect to EA?*

  – *What is the state of Finnish ICT procurement in reacting to market change via tendering?*

3.3 Research Methods

In this section, the research method is described. In Subsection 3.3.1, the literature search method is described. In Subsection 3.3.2, the interview setting and the methods are described, and finally, in the Subsection 3.3.3 is detailed description of transcribing and coding methods.

3.3.1 Literature search

The literature search is detailed in the regard to EA and EA maturity themes. Otherwise, the literature search supports the formation of the interview, and research question. In this master's thesis, the Scopus database serves as the literature source. Systematic literature review methods are in use to examine the background of EA in the public sector. The search words are EA and the public sector. Searches limit to title, abstract, and keywords, and the language is English. For in the public sector, search results in 268 pieces. Articles with titles and abstracts which do not mention public sector or EA are rejected, as well as those which have different scopes. Also, conference titles were excluded. Reviews are excluded from the results, which results in 203 pieces. To further limit the results, the next phase is to analyze the abstracts to manage the scope, which results in 110 pieces. The final query is:

> *TITLE-ABS-KEY (enterprise AND architecture AND public AND sector) AND (LIMIT-TO (EXACTSRCTITLE , "ACM International Conference Proceeding Series") OR LIMIT-TO (EXACTSRCTITLE , "Proceedings Of The European Conference On E Government Eceg") OR LIMIT-TO (EXACTSRCTITLE , "18th Americas Conference On Information Systems 2012 Amcis 2012") OR LIMIT-TO (EX-ACTSRCTITLE , "Ceur Workshop Proceedings") OR LIMIT-TO (EX-ACTSRCTITLE , "19th Americas Conference On Information Systems Amcis*

2013 Hyperconnected World Anything Anywhere Any-time")) AND (LIMIT-TO
(LANGUAGE , "English"))

Furthermore, to limit the results in European research, abstracts are examined, and the final count for results is 29 pieces. Additional literature was searched for the EA maturity via the Scopus database. The search words were EA maturity, IT alignment, and agility.

(TITLE-ABS-KEY (enterprise AND architecture AND maturity)) AND ((it
AND alignment)) AND (agility)

All articles have JUFO classification 1-3, and they are peer-reviewed; others were ruled out. Then the article titles and abstracts were reviewed, and relevant IT alignment, EA maturity, and organizational agility-themed articles were selected. The search revealed 25 pieces, and irrelevant findings were ruled out until nine pieces remained, so for the purposes and objectives of this study, the method is adequate.

3.3.2 Interviews

In this subsection the interview method and participants are described. The role of the interviews is to examine the state of Finnish ICT procurement via EA and tendering. The questions for the interview have grounds in the literature on ICT procurement and EA. To formulate the pattern for the questions, the interview method needed to be evaluated.

Structured interviews are strong in the consistency (Myers 2020). The questions are pre-formulated, the order of the questions is pre-set, and the time reserved for the interview is a standard (Myers 2020). Structured interviews are in place as an example for telephone interviews, polling, and market research. In structured interviews, the weakness lies in the strict structure; new questions cannot be added even if the interviewee tells something noteworthy regarding a newly emerging subject. Therefore, the method is not suitable for the requirements of this thesis research. Previous research depicts that there is an inconsistency between public agencies and how they perceive EA (Niemi and Pekkola 2017; Seppänen, Heikkilä, and Liimatainen 2009). Therefore, the interview situation must be arranged so that the interviewer has an opportunity to clarify the terms and ask detailed questions.

Unstructured interviews allow the interviewee to depict freely (Myers 2020). Unstructured interviews rarely have pre-formulated questions (Myers 2020). New questions may arise during the interview, and improvisation is in place. However, the free rein for the interviewee to speak may result in many outcomes; new themes, subjects, lots of material, or none at all (Myers 2020). Unstructured interviews lack consistency.

The semi-structured interviews are less formal than structured interviews, and it is the most used method in business and management studies (Myers 2020). For this master's thesis, some of the questions are pre-formulated, and there is room for spontaneous questions. The semi-structured interview is an adequate method for the thesis because it gives the best parts of structured and non-structured interviews (Myers 2020). A certain structure guides the interviews with pre-formulated questions or themes, and all the interviews start with the same set of questions while allowing improvisation when needed. The semi-structured interviews are adequate in risk management as well (Myers 2020). Pre-formulated set of questions limits the time, and the interviewees could prepare themselves before the interview.

Interviews were recorded between November 2021 and May 2022. Besides the pre-formulated questions, participants were encouraged to contribute what they felt was important. The structure of the interview was similar to all of the participants: a standard set of questions to begin with. Participants received the theme list for the interview beforehand, which helped to guide the direction of the interview. The interview duration varied from 45 min to 63 min. Sometimes intriguing topics need to be discussed more thoroughly. The average duration was 55 minutes. Table 1 presents the participant info.

Organization	Abbreviation	Position	Field	Interview Duration
Public agency 1	PA1	Chief position	ICT	47 min
Public agency 2	PA2a	Manager position	ICT	48 min
Public agency 2	PA2b	Senior Specialist	ICT	62 min
Public agency 3	PA3a	Head of procurement	Procurement	63 min
Public agency 3	PA3b	Manager position	ICT	49 min
Public agency 4	PA4	Chief position	ICT	58 min
Public agency 5	PA5	Manager position	ICT	56 min

Table 1. Interview data.

Public agency 1 (PA1) is a government-owned enterprise (GOA), and its turnover is approximately 140 million euros. PA1 is high expertise organization in the transport sector. In the public agency (PA2), two interviews took place. In quotations, the separation between the two is marked with code PA2a and PA2b if necessary. PA2 is state administration with a yearly budget of 110 M€. Public Agency 3 (PA3) is a city with a yearly budget of 740 M€. PA3 had two interviewees, which are separated with abbreviations Pa3a and PA3b if necessary. Public Agency 4 (PA4) is a city with a yearly budget of 140 M€. Public Agency 5 (PA5) has a yearly operating budget of 375 M€. PA5 is a high expertise organization in its field. The field of operation demands information systems in daily operations even though the need is not rationalized throughout the organization. Information systems are merely tools, not strategy builders. Figure 1 presents the public agencies' budgets per year.
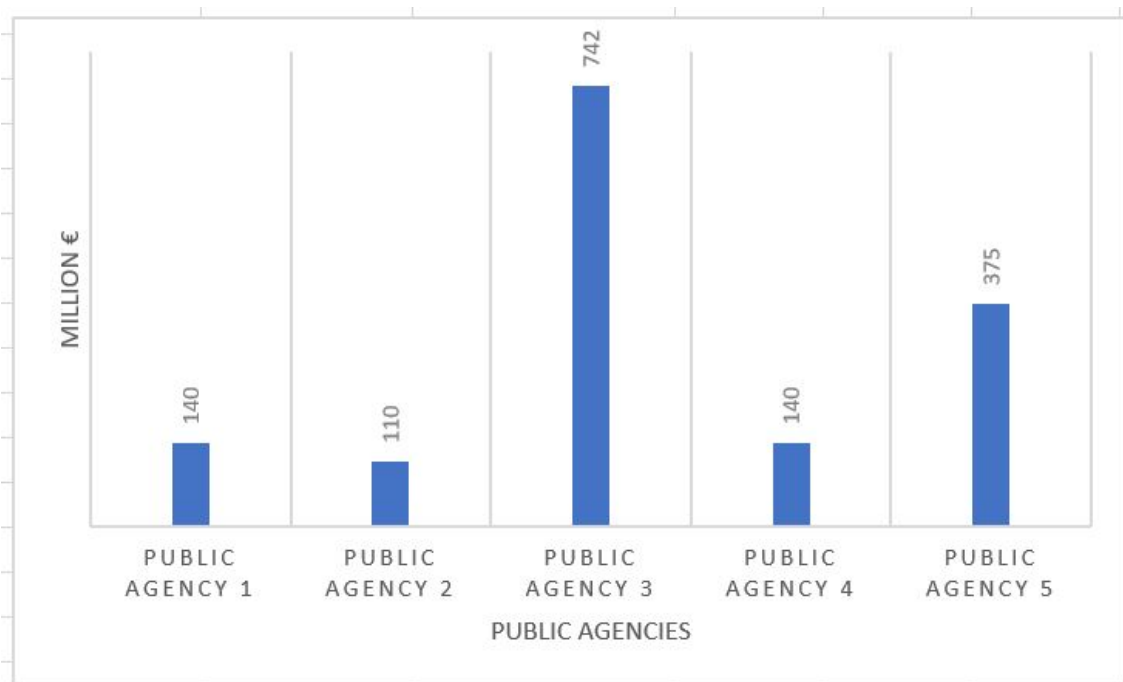

Figure 1. Public Agencies. Budgets per year.

3.3.3 Transcribing and Coding

Interview recordings storage is in the university's OneDrive folder. In the transcription phase, all identification data are removed. Coding takes place in Atlas.ti software's cloud version. The interviews demanded two sets of coding, which is similar to the thesis structure. The

first part revolved around the public procurement theme, and the second on EA. After the transcribing and modifications, the first round of coding, also the initial coding (Charmaz 2006) or open coding (Myers 2020), took place. Following Charmaz (2006) and Myers (2020) practices on open coding, the incident-by-incident coding (Charmaz 2006) seemed most suitable for the interviews. Focused coding (Charmaz 2006) enabled the data to form two larger categories public procurement and EA maturity. After focused coding, the axial coding (Myers 2020; Charmaz 2006) began. The axial coding enabled further categorization of EA maturity and special characteristics in public ICT procurement.

In the open coding, the incident coding was intuitive and reactive, which is proper in the initial stages of grounded theory formalization (Charmaz 2006). For the focused coding Ross, Weill, and Robertson (2006) four-stage EA maturity model began to make sense. The business objectives and funding priorities are core decisions to make before procurement as it is the method to purchase in public agencies. However, the public procurement practice has different characteristics than private purchasing, which lead to the formation of the public procurement category. Table 2 presents the Ross, Weill, and Robertson (2006) learning objectives for EA maturity.

The coding on EA themes followed Ross, Weill, and Robertson (2006) matrix on how to evaluate the EA maturity stage. The matrix and the source material Ross (2003) and Ross, Weill, and Robertson (2006) offered support to the subjective evaluation of the interview results with specific examples. The strength of Ross, Weill, and Robertson (2006) model is that it has strong practical roots, which aids in evaluating the incidents the participants described. The matrix deepens the understanding of the Ross, Weill, and Robertson (2006) model. Every category has seven subcategories to describe the characteristics of different relationships.

For public procurement, the source material (Keränen 2017; Torvinen and Ulkuniemi 2016; Nuottila, Aaltonen, and Kujala 2016) helped to use the different stages of the procurement as a skeleton for the focused coding. The last phase in coding and theory formation, the axial coding, binds the two large categories into one to describe the ICT procurement and capabilities of public agencies to react to the market.

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability	Local IT applications	Shared technical platforms	Company-wide standardized processes or data	Plug-and-play business process modules
Business objectives	ROI of local business initiatives	Reduced IT costs	Cost and quality of business operations	Speed to market; strategic agility
Funding priorities	Individual applications	Shared infrastructure services	Enterprise applications	Reusable business process components
Key management capability	Technology-enabled change management	Design and update of standards; funding shared services	Core enterprise process definition and measurement	Management of reusable business processes
Who defines applications	Local business leaders	IT and business unit leaders	Senior management and process leaders	IT, business and industry leaders
Key IT governance issues	Measuring and communicating value	Establishing local/regional global responsibilities	Aligning project priorities with architecture objectives	Defining, sourcing, and funding business modules
Strategic implications	Local/functional optimization	IT efficiency	Business operational efficiency	Strategic agility

Table 2. Matrix for coding the incidents describing enterprise architecture maturity. Adopted from Ross, Weill, and Robertson (2006).

The budgets of the public agencies in this thesis vary from 110-742 million euros. Public agency types are also different; government-owned enterprises (GOA), state administration, two cities, and one healthcare organization.

4 Results

In this chapter, at first, the public agencies receive their category in Ross, Weill, and Robertson (2006) EA maturity model, where IT capability, business objectives, funding priorities, key management capability, which defines applications, key governance issues, and strategic implications are evaluated. Secondly, the ICT procurement characteristics are presented in the pre-tender, tender, and post-tender phases.

4.1 Enterprise Architecture Model

Ross, Weill, and Robertson (2006) EA model has four stages and seven criteria, which through the EA maturity can be evaluated. In PA1 IT capability-wise, PA1 is between the optimized core stage and business modularity stage in EA maturity. The aim is to purchase systems as a service solution (Saas) to the cloud rather than tailored software. Ross, Weill, and Robertson (2006) emphasizes that ready-made solutions and reliance on external processes increase when the organization moves towards the fourth stage. PA1 depicts that they do not have even one developer in the agency, and they purchase all the software. Ross, Weill, and Robertson (2006) depicts that outsourcing is an option for the EA processes. However, the organization cannot outsource the EA decisions. PA1 has outsourced IT development but has well-disciplined practices within the organization. For example, business units cannot buy solutions that are customized solely for them. The solutions must be adaptable and compatible with existing structures and other business units.

PA1 has diminished the number of vendors significantly. At first, PA1 found that nearly 100 vendors execute their information systems. Furthermore, many of the solutions had a price tag of just under 60 000€, which is the threshold that above demands procurement. PA1 representative thinks these solutions result from unplanned spending and panic. In recent history, PA1 has overcome technology standardization which diminished the number of vendors. Ross, Weill, and Robertson (2006) describes that when the IT capability matures from local IT applications to shared technical platforms, the number of information systems and the IT costs diminish. In the business modularity stage, business units receive some con-

trol back and may have customized software that interoperates seamlessly with existing EA. PA1 has customized software besides the ready-made solutions, and the aim is to purchase reusable platforms with modifiable user interfaces. It enables PA1 to have standardized technology and keep the core optimized. PA1 shows minimal data and software duplicity, and the systems interoperate. PA1 has at least an optimized core architecture characteristics in IT capability, and the IT capability is moving towards the business modularity architecture stage.

PA1 has business objectives which have characteristics of optimized core enterprise architecture stage. Throughout the interview, the message is the same; PA 1 evaluates the investments and priorities precisely and aims to define the benefits against the costs. For example, PA1 thinks that customized software has higher costs than benefits. Reusable business process components are visible in PA1. Decentralized project management practices guide all projects, and there the need for procurement is evaluated.

Furthermore, PA1 has a procurement team, where the experts help to prepare the procurement and are responsible for the tendering phase. The project management decides, what to procure, but in larger entities, the decision-making shifts upwards in the organization. Ross, Weill, and Robertson (2006) find out that centralized purchasing practices serve the best organization's strategic objectives, even if the standardized practices may seem sub-optimal for the business unit. Re-usability, optimized purchases, and disciplined IT culture are high on the priority list in PA1. In the fourth stage of Ross, Weill, and Robertson (2006) model, business, IT, and industry leaders cooperate to define the applications. PA1 describes that field expertise comes from the business unit, the industry leader contributes with market information, and a procurement team member is an expert in public procurement.

In the optimized core stage, the project priorities align with architecture, and the organization aims for efficiency in its practices. PA1 has far developed practices throughout the agency, and efficiency is high. However, the legislative tasks are not always in line with these principles. PA1 depicts that sometimes the legislative tasks lack business cases, but they are nevertheless mandatory. Here, the benefits cannot be measured straightforwardly in cost-benefit analysis, and therefore inefficiency might always be present in public agencies, even if the processes, management, and IT are optimized. Nonetheless, the benefit might still

exist, even if it has no monetary value. To summarize the EA maturity development in PA1, it has passed the standardized technology stage, it has many optimized core characteristics, and it is moving towards the business modularity stage. Table 3 describes the EA maturity mapping in PA1.

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability			Company-wide standardized processes or data	Plug-and-play business process modules
Business objectives			Cost and quality of business operations	
Funding priorities				Reusable business process components
Key management capability				Management of reusable business processes
Who defines applications		IT and business unit leaders		IT, business and industry leaders
Key IT governance issues			Aligning project priorities with architecture objectives	
Strategic implications			Business operational efficiency	

Table 3. Public Agency 1 Enterprise Architecture Maturity Profile

In PA2, the IT capability is compatible with Ross, Weill, and Robertson (2006) EA maturity model's optimized core structure. Information systems produce reliable and coherent data. PA2 uses the data successfully to back up the decision-making processes, and these decisions have a substantial impact on society. Hence, reliable information systems are a necessity for PA2. In the optimized core stage, IT capability processes are standardized, and PA2 uses project portfolio management to execute the organization's strategy. In project management, the incentive is to manage the IT, map out the benefits and resources before the project initiates and evaluate whether the project and business objectives meet.

Ross, Weill, and Robertson (2006) depicts that if the organization sees the legislation as

an opportunity to multiply the previous business function, it means that the organization is mature in its practices. Furthermore, Ross, Weill, and Robertson (2006) depicts that the organizational culture becomes positive towards the ruling if the funding priorities are towards reusable business process components. Both interviewees in PA2 depict that the procurement act enables many things when used correctly. Hence, the management of reusable business processes is mature in PA2.

PA2 purchases software, solutions, and development management from vendors. The funding priorities are in ready-made solutions, and PA2 has ruled that they do not purchase solutions that need to be developed from scratch. According to Ross, Weill, and Robertson (2006), it is a sign of modular business architecture if the development is outsourced and the incentive is to purchase ready-made solutions. Similarly, in PA2, the key IT governance issues link to the modular business unit stage, where the incentive is to define, source, and fund business modules. Both of the interviewees' recon that the software lifespans can be easily extended, and the vendor changed because PA2 control practices are adequate, and IT alignment allows it.

Overall, the strategic and IT infusion seems agile in PA2. However, similarly to PA1, PA2 has a legislative task, which hinders the effectiveness of the innovative use of IT. PA2 clientele does not necessarily have the incentive to participate in agile IT development. However, the processes inside the organization are developed systematically and strategically. Ross, Weill, and Robertson (2006) recon that high maturity enables innovation, which is present in the attitudes and depiction of the interviewees. For example, PA2 has applied funding for a unit that is beginning to explore low-code development. To summarize, PA2 EA is well-matured. Most of the characteristics are aligned with Ross, Weill, and Robertson (2006) business modular stage in EA maturity. Table 4 describes the PA2 EA maturity mapping in PA2.

In PA3, the EA maturity characteristics disperse more than in PA1 and PA2. PA3 differs from PA1 and PA2 because it is quite large, and it is not directly under the governmental ruling, as it is a city. IT capability in PA3 is demanding to categorize explicitly. For example, the operating budget may hinder purchasing the wanted solutions in PA3. PA3a depicts that sometimes it needs to postpone some projects because the EA is not ready for it. After

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability			Company-wide standardized processes or data	
Business objectives			Cost and quality of business operations	Speed to market; strategic agility
Funding priorities				Reusable business process components
Key management capability			Core enterprise process definition and measurement	Management of reusable business processes
Who defines applications				IT, business and industry leaders
Key IT governance issues				Defining, sourcing, and funding business modules
Strategic implications		IT efficiency	Business operational efficiency	Strategic agility

Table 4. Public Agency 2 Enterprise Architecture Maturity Profile

PA3 makes the decision to postpone the project, it may need to consider planning a holistic solution for the problem. PA3 aims to build coherent EA by prioritising projects with existing EA requirements.

PA3 has an incentive to evaluate the cost and quality of the business operations against the receivable benefits. However, the holistic view of the EA is not managed top-down. Business unit leaders are supposed to have a clear understanding of the EA. PA3a sees this as a problem. Some of the units have a clear picture, and others do not, and the top management does not rule or guide it.

However, PA3 has decentralized EA unit that keeps track of the ongoing projects and existing solutions. In Ross, Weill, and Robertson (2006) theory, managed project practices and full-time EA unit are signs of optimized core maturity stage. However, the different views on the EA between business units cause dispersion. In PA3, the business unit leaders and managers

need to have the EA landscape in their heads, since EA initiatives do not receive top-down support from the executives.

In PA3, the funding priorities have characteristics from optimized core and standardized technology maturity stages. However, the incentive is to acquire shared infrastructure services. PA3 uses cloud services and platforms with modifiable user interfaces. However, PA3a depicts that:

"We are trying to get rid of the little systems which are tailored to one unit."

PA3 has local IT applications even if the IT capability has evolved towards shared technical platforms. PA3a describes that PA3 has overlapping systems and inconsistent data, but the aim is to change the situation. PA3a wishes for a data management unit, which could enhance establishing consistent data throughout the organization. Currently, PA3 has decided which system has the data that can be modified and in which systems it cannot be modified. Ross, Weill, and Robertson (2006) describes these characteristics to be part of the transition from the application silo to the standardized technology maturity stage.

On the other hand, PA3 has been able to reduce the number of vendors and build agile capabilities, which they can acquire emerging technologies such as low-code development or artificial intelligence. PA3 participates in research and listens to the IT market leaders when they are searching for solutions. On the other hand, some business units drag behind.

To summarize, PA3 has the initiative to move towards higher maturities in EA. PA3 has a positive attitude toward legislation that regulates EA and purchasing. These act as possibilities for the organization, which is typical for the organizations in higher EA maturities (Ross, Weill, and Robertson 2006). However, the dispersed characteristics in different stages of EA maturity describe the problems which may arise in larger organizations and in public agencies. The change is slow, and it happens in stages. In PA3, the IT is partly siloed, data is not consistent, systems are overlapping, and simultaneously some units acquire artificial intelligence, and the organization values reusable business processes. Furthermore, in PA3, the problem seems to be in the top-down management practices; it has established the organizational structures which through to execute the strategy, but the leadership in managing the strategy is inadequate. Table 5 presents PA3 EA maturity characteristics.

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability	Local IT applications	Shared technical platforms		
Business objectives	ROI of local business initiatives	Reduced IT costs	Cost and quality of business operations	
Funding priorities	Individual applications	Shared infrastructure services	Enterprise applications	Reusable business process components
Key management capability		Design and update of standards; funding shared services		
Who defines applications		IT and business unit leaders		
Key IT governance issues			Aligning project priorities with architecture objectives	
Strategic implications			Business operational efficiency	

Table 5. Public Agency 3 Enterprise Architecture Maturity Profile

In PA4, IT capability has characteristics that fit business silo and standardized technology EA maturity stages. In practice, in PA4, some of the applications are still local, and the shift towards shared technical platforms is happening, and some of it is already in use. In the business silo, vendor-lock is present:

> *"Legacy problem is like a vending machine for them (vendors), the term for it is vendor lock-in. We are in deep vendor lock-in. In theory, it is possible to change the vendor, but it is so expensive that there is no point."*

PA4 describes that vendor lock-in is the reason to use negotiated procedure without a call for tenders. Vendor lock-in strengthens the silo structure in an organization. In terms of EA maturity, it means that PA4 has limitations in IT to completely move to the standardized technology stage. However, PA4 has an incentive to solve the problem in the future. In the

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability	Local IT applications	Shared technical platforms		
Business objectives	ROI of local business initiatives	Reduced IT costs		
Funding priorities		Shared infrastructure services	Enterprise applications	
Key management capability	Technology-enabled change management	Design and update of standards; funding shared services		
Who defines applications		IT and business unit leaders		
Key IT governance issues		Establishing local/regional global responsibilities	Aligning project priorities with architecture objectives	
Strategic implications	Establishing local/regional global responsibilities			

Table 6. Public Agency 4 Enterprise Architecture Maturity Profile

current stage, PA4 has limited capability to react to changes in the market. The inability to change the vendor and old technologies determine the action. The realization of this, however, depicts that the change is happening, and the shift from the silo structure is in process.

PA4 describes that they have cloud services and platforms with modifiable user interfaces in use. The future direction is to acquire systems with open APIs and capabilities to transform and grow. PA4 plans for future IT investment, where the information usability and data pools are wanted. PA4 believes that shared technical platforms are part of the solution. Ross, Weill, and Robertson (2006) depicts that the development and shift from one maturity stage to another must be made gradually and with patience. PA4 depicts that the old ridged systems are replaced gradually with new systems, which creates the grounds for the development of data management practices. Technology-enabled change is a stepping stone towards standardized

technology.

In PA4, current business objectives have business silo characteristics, even if the direction is to reduce IT costs with shared IT solutions. PA4 participates in the shared project with neighbor cities, where they develop a building block, which allows other systems to attach to it effortlessly. These characteristics reveal, that technology-wise PA4 is in the process to from standardized technology towards optimized core EA maturity. However, in PA4, leading practices hinder the development, and the business units have quite a lot of power to make decisions to serve solely their needs. PA4 describes that sometimes the IT department receives the information from the purchase afterwards. The problem is in missing project management practices. Before the purchase, necessarily no-one maps out the budget and personnel resources.

To summarize, PA4 suffers from vendor lock-in, project management practices prior to the procurement are missing, and on the other hand, the technology standardization is in process, and the future direction is toward EA applications to connect the existing systems and data. Table 7 describes the EA maturity characteristics in PA4.

In PA5, the IT capability is immature. The applications are local and designed for the practices of one single business unit. In the interview, PA5 depicts that:

"We have 1400 information systems."

The amount of information systems is substantial. Ross, Weill, and Robertson (2006) reckons that the number of information systems decreases heavily when the EA maturity evolves from application silo to standardized technology architecture. However, PA5 has adopted the monolithic system, which enables structured documentation, and it is in use throughout the organization and in the similar organizations in the area as well. PA5 has an incentive to purchase ready-made solutions, and the PA5 representative depicts that all ready-made software purchases are steps in the correct direction. The shared technical platform should enhance the standardization of the processes of an organization (Ross, Weill, and Robertson 2006). However, PA5 has encountered difficulties in it:

"Two things where it fails; in the tendering phase, the organization's EA and the

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability	Local IT applications	Shared technical platforms		
Business objectives	ROI of local business initiatives	Reduced IT costs		
Funding priorities		Shared infrastructure services	Enterprise applications	
Key management capability	Technology-enabled change management	Design and update of standards; funding shared services		
Who defines applications		IT and business unit leaders		
Key IT governance issues		Establishing local/regional global responsibilities	Aligning project priorities with architecture objectives	
Strategic implications	Establishing local/regional global responsibilities			

Table 7. Public Agency 4 Enterprise Architecture Maturity Profile.

> *system's architecture were not evaluated, how they would fit. The second thing is leadership. In wider entities, such as this system, the discipline should be in place to guide the development."*

Ross, Weill, and Robertson (2006) emphasizes the importance of discipline in the EA maturity evolution - the higher the maturity is, the stronger discipline it needs. Furthermore, the processes in the organization should change simultaneously with the new information systems (Ross, Weill, and Robertson 2006). In PA5 seems that the new system has not evoked a change in the processes:

> *"Every unit had the freedom to define the needs and functions. I think that it was too loose. I would have needed a certain type of guidance."*

PA5 adopted the invasive system, and it did not have control over it. Business units did not

change their processes, which resulted in contradicting functions in one system. Luckily, some business units were able to change their processes and invent innovative ways to adopt the system. PA5 depicts that these units are great examples for the other units which resist the change.

PA5 evaluates the new IT needs locally in the business units, and Pa5 does not have project management practices to evaluate the upcoming and existing IT projects. The projects which exceed the threshold for procurement are evaluated by upper-level management. PA5 interviewee hopes for a project portfolio management unit that would control the purchases and consider the EA before the purchase.

PA5 representative experiences that the organization's EA is not paid attention to at all in the procurement, and hence the performance is poor. PA5 depicts that the leadership to guide the purchases is missing, and it should come from the top management. PA5 recognizes that the organization is missing clear protocols and practices. Furthermore, PA5 depicts that the contradiction between the long list of requirements in the procurement lack of control regarding EA results in conflicts in the IT landscape. Strategically, the PA5 representative has ideas on how to develop the EA maturity further, even if the practices in the organization drag behind. Table 8 presents PA5 EA maturity mapping.

4.2 ICT Procurement Characteristics

In this section, ICT procurement characteristics are presented in three parts; Subsection 4.2.1 presents findings from pre-tender phase, Subsection 4.2.2 presents the findings from the tender phase, and finally in Subsection 4.2.3 the post-tender phase findings are described.

4.2.1 Pre-tender

All public agencies in this study use the preliminary market consultation with the vendors and communicate with the vendors in the pre-tender phase. The preliminary market consultations may have many forms. PA1, PA2, PA3, and PA4 map out the market possibilities. In the pre-tender phase, PA5 relies on requests for information (RFI). In most cases, the communication is more than a formal connection to the vendors via RFIs; the RFIs may be an excellent way

	Business Silos	Standardized Technology	Optimized Core	Business Modularity
IT capability	Local IT applications	Shared technical platforms		
Business objectives	ROI of local business initiatives			
Funding priorities	Individual applications			
Key management capability	Technology-enabled change management			
Who defines applications	Local business leaders			
Key IT governance issues	Measuring and communicating value	Establishing local/regional global responsibilities		
Strategic implications	Local/functional optimization	IT efficiency		

Table 8. Public Agency 5 Enterprise Architecture Maturity Profile

to open up the market dialogue with the vendors. Usually, public agencies seek realism from the conversations with vendors, which is where they receive information on market options. PA4 benchmarks how the other public agencies have solved the problem.

Another forum to familiarize themselves with the market options outside the procurement is everyday conversations and networking events with the vendors. However, the PA4 representative has opposite experiences and understanding of the procurement act. PA4 thinks free communication with the vendor before the tender is not allowed and may generate problems with the market court. PA2b thinks that the procurement act enables free communication with the vendors if it is used correctly. Furthermore, PA2b thinks that the procurement act is heavy for those, who do not know how to use it, and PA2a depicts that if some of the vendors ask for something essential, PA2 delivers the information to all participants.

PA1 depicts that the Act on Public Procurement and Concession Contracts (2016) encourages the public agencies and vendors to procurement theatre, meaning that before the public call for tender comes out, the decision is already made. Some public agencies define the

requirements to fit only one vendor's solution. PA5 reveals that sometimes procurement proposal concerns only the current situation, nothing more. Furthermore, PA5 depicts that once one business unit wanted to have a particular product from the market, the proposal passed higher-level decision-making. The tender was prepared in a way that only one vendor could participate in the negotiations. The vendor won 10 M€ procurement. PA5 depicts that pre-selecting the solutions before the tender call is not rare.

Sometimes, public agencies do not know which kind of solution they want. PA2 has had conversations within the organization that if the business unit needs consultation to prepare the tender, is it part of the procurement process. Act on Public Procurement and Concession Contracts (2016) mandates the preliminary market consultation, which is interpreted as regulation on pre-tender phase (Holma et al. 2020). Preliminary market consultation with the vendor participating in the tender phase should not harm the fair competition (Act on Public Procurement and Concession Contracts 2016). In the interviews, PA2a depicts that:

> *"Always before the tender phase, we scan the familiar vendors, and at the latest in the tender, we give the other vendors possibility."*

Public agencies PA1, PA2a, PA2b, and PA3 recon that in the procurement, they need to know explicitly the procurement practices and *"the game the vendors play"*. A shared vision is that vendors' interests are not always in line with the public agencies' vision. As an example, all public agencies share the view that it would be recommendable to purchase ready-made software. However, public agencies reckon that vendors are incentivized to offer customized solutions. PA4 depict that they do not want to be beta-testers for the software. PA5 recons that, understandably, the business unit wants to acquire tailored software, and the price is often tempting. However, the pitfall may lie in the organization's resources to commit to the development after purchase.

Lack of personnel and adequate service design skills may generate costs from outsourcing. Inadequate skills to purchase software that fits the existing EA may generate unanticipated implementation costs. Poorly planned lifespan management prior to the tender may result in vendor lock-in. Whether to purchase ready-made or customized solution must be defined early in the pre-tender phase, emphasizing the necessity of preliminary market consultation.

All public agencies in this study have a procurement unit or team responsible for the tender. The centralized procurement units or teams have standardized procedures. Experts in procurement, layers and often ICT personnel prepare the call for tenders in a way that is consistent with law. PA5 recons that the multi-professional procurement units are an improvement compared to the past. All the other public agencies share the view. As PA1 puts it:

> *"If you don't have a clue what you are doing, at least the public procurement guides you to do decent."*

The business unit in charge of the purchase draws initial requirements for the information system. Before the business unit's need reaches the procurement unit, some public agencies, PA1, PA2, and PA3, have decentralized project management, where they map out whether separate business units have similar projects, if combining the resources is possible, and whether they have resources to initiate the project. PA2 depicts that decentralized project management enhances efficiency.

PA1, PA2, and PA3 depict that in decentralized project management, the specialists from different units (business, ea, IT, procurement) evaluate their territory. Before the project, project management scans the resources and determines whether the business case exists or initiates the project because it is mandated. Procurement may happen in various places during the project, prior to the initiation to receive help from consultants, during the execution, or during the maintenance phase. Therefore, one project may have multiple procurement within. Emphasis is on well-prepared projects. Literature findings depict that the tender needs to be carefully prepared because otherwise, the project may prolong, the budget may be exceeded, or the system may fail before production (Iloranta and Pajunen-Muhonen 2012; Baily et al. 2008; Holma and Sammalmaa 2018; Holma et al. 2020; Keränen 2017).

Figure 2 presents how decentralized project management unit and need to initiate procurement link. The essential change in the project leads to new procurement, and the cycle restarts.

PA3 hopes for top-down support from senior management to execute EA – the agency lacks authority which sometimes results in overlapping systems in different units. PA3 has decided

that every business unit must commit to the project before reaching the procurement unit. Furthermore, PA3 actively tries to receive a brief of the project early on to guide the planning in the correct direction. PA4 and PA5 do not map out the project resources before the initial project info reaches the procurement unit, which results in lacking human resources, poor implementation, systems incompatible with previous EA, and prolonged projects. Both of these agencies hope to enhance project management practices.

In agencies PA3 and PA4 IT departments run checks before the project enters the procurement unit. In the procurement unit, all public agencies have standardized procurement activities. Layers and procurement experts use the procurement processes efficiently and skillfully. PA5 recons that the procurement team is multi-talented with layers, procurement experts, and ICT experts. However, professional and planned purchasing is missing. The top management does not offer the support to purchase existing EA in mind.

In the pre-tender phase, public agencies also decide what procurement procedure to use. All public agencies have varying ways to procure, and the procedure type depends on the target outcome. During the interviews, public agencies mentioned open, restricted, and negotiated procedures. Negotiated procedure without a prior tender call is an emergency solution for public agencies, hand in hand with in-house purchase. PA3a and PA4 depict that negotiated procedure without prior tender call usually happens in vendor lock-in situations or when the time is scarce. PA3a depicts that sometimes the legacy system needs to be replaced and set to procurement, no matter how high the migration costs are.

PA2 uses negotiated procedures, which usually result in good outcomes, but PA2a recons that negotiated procedures are heavy for the agency and demand resources from the agency. All public agencies agree that the tender must be well-defined before publication. If there are errors, they are cumbersome to fix after the tender call is published. PA3b says:

> *Legal practice has proven that the modifications are not allowed, even if they are allowed in the law.*

PA3b thinks that the tendering is flawed. In the tender call, the business unit and the procurement team should know the result precisely, even if it does not exist yet. PA1 depiction is similar. PA1 criticizes Act on Public Procurement and Concession Contracts (2016) because

it encourages public agencies to run the procurement rigidly in the environments, which should move towards agile methods.

4.2.2 Tendering

Public agencies publish the call for tenders and decide on the vendor in the tender phase. PA1 has a strategy to set high basic requirements, ensuring that the participants' quality adequate. PA1 says that the principle of enhancing the quality and lowering the price is flawed. PA2a recons that the price is relatively demanding to erase from the selection criteria. PA2 defines in the tender phase that if the participating vendor offers an unrealistic price and wins the tender, PA2 will terminate the contract immediately.

However, Act on Public Procurement and Concession Contracts (2016) mandates choosing the most advantageous offer, which often means that the price has heavy emphasis. PA2a depicts that for some, it is demanding to calculate the most advantageous offer. PA2 gains an advantage from experience in previous procurement why they can do the calculations and estimate the lifespan costs. PA4 depicts a similar; experience that helps scan the apparent pitfalls in criteria and vendor selection. PA1, PA2, and PA4 reckon that it is wise to interview the team and set soft criteria such as the vision of the team, competence and ambition, in addition to the software need definitions and price, to make the best vendor decision.

Public agency's EA has varying ways to emerge in the tender phase. PA1 field of business is mission-critical; software-wise, everything they purchase must go through many official checks. PA1 manages the procurement practices top-down; business units cannot purchase something that fits their purposes solely. The purchasing practices support standardized technology solutions and sustainable software life span management.

PA2 uses the JHS-179 standard to define the target architecture to avoid surprises in the implementation (*JHS 179 Kokonaisarkkitehtuurin suunnittelu ja kehittäminen* 2017). Furthermore, in PA2, IT governance sets objectives for the tender. In PA2, the organization's strategic objectives guide the planning of the software requirements in the tender phase. The top management has set the objective not to purchase customized products. In PA2 minimum criteria for the software is that it has ready-made components and the user interface is mod-

ifiable. PA2a recons that the organization's IT landscape is complex and demands skillful personnel to manage it, and many times the strategic skills to manage ICT procurement are missing.

In the tender phase, PA4 describes the current state EA. In addition, PA4 describes the target stage EA in advantaged ICT procurement. Similar to PA4, PA3 uses the current state EA descriptions in the tender phase. Furthermore, PA3a recognizes two main methods to build the tender. Sometimes PA3 purchases the platform and the development in one procurement, and sometimes everything is purchased separately; platform, development, and maintenance. However, PA3 recognizes that management becomes complex if the number of vendors rises.

PA5 depicts that the organization's EA does not show in the tender. Usually, EA is examined after the vendor selection in the post-tender phase, which is costly, complex, and prolongs the project. PA5 describes that the current EA initiatives exist, but they do not show in practice.

EA management via tendering is demanding. PA1 and PA2 recon that vendors may not have an interest in planning the solutions to fit the existing EA. PA1 expects vendors to have a holistic view of the buyer's EA, mainly when the same vendor provides different solutions to different business units in the public agency. PA1 sees it as an issue. PA2 recons that smaller vendors are more interested in delivering easily deployable and manageable solutions, and the smaller vendors are more flexible than the larger ones. PA2a thinks PA2 is more significant customer to the small vendors than the large ones.

4.2.3 Post-tender

PA1, PA2, PA3, and PA4 reckon that it would be convenient to predict the future needs in the tender phase because essential changes are not possible during the contract period. PA1 depicts that sometimes they have flourishing cooperation with the vendor, but the law causes unnecessary vendor changes. For example, the original software works well, and a new need near the original solution emerges. It would be easily developed with the existing vendor but Act on Public Procurement and Concession Contracts (2016) does not allow essential changes in the contract period. As a consequence, new procurement needs to be initiated.

PA2a says that sometimes they try to include consult services in the tender and further include

phrasing in the tender that the solution could be used in all business units in the organization. However, PA2a thinks that they have not always succeeded in it because future needs are almost impossible to predict. PA2b recons that they keep an excellent record of modeling the software development to prepare the vendor change.

Traditionally, public agencies have paid the vendors in installments, and if they disagree with the performance, they may refuse to pay the installment. Another way to manage the contract period is to set fines for the vendors. Furthermore, some agencies use the option to continue the vendor contract for the next period as a carrot. PA1, PA2, and PA3 recon that these methods encourage rigid and waterfall-like software development. Furthermore, PA1, PA2, and PA3 recon that the vendor should have an ambitious attitude to produce its' services with quality, rather than to be pressured with installments and fines to produce barely acceptable. PA2b thinks it is within the agency's management culture whether they can motivate vendors without the use of ramifications. In in-house purchases, PA4 thinks the installment with-holding is the only option to receive an acceptable solution. PA3b thinks the permanent contract is far more motivating to the vendors than the temporary contract with the option for the second contract period.

PA1 depict that they use service level agreements (SLAs) in the contract period, which is not ideal. All-in-all, public agencies in this study agree that the public sector uses far more sticks than carrots in vendor relationships, which does not work.
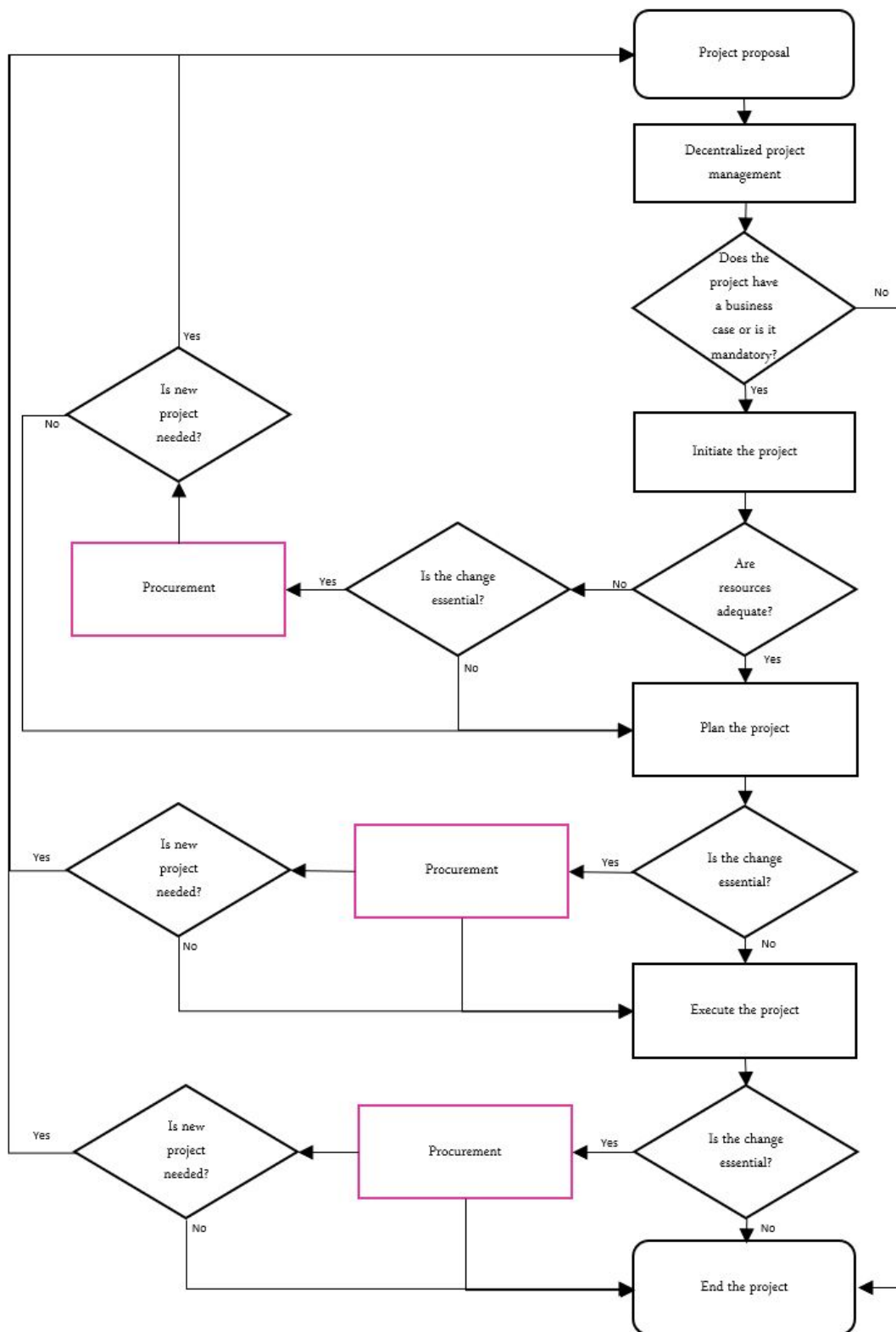
Figure 2. Project model with procurement needs.

5 Discussion

In this chapter, the research questions are revisited in Section 5.1, threats to validity in 5.2, related work in 5.3, and future work in 5.4.

5.1 Research Questions Revisited

In this master's thesis, the research question *what is the state of Finnish ICT procurement* was evaluated through EA and how public agencies can react to market change via tendering. First, the public sector EA maturity findings are presented, then the tendering characteristics.

Exploring EAs in public agencies reveal that the EA initiatives exist in all participating public agencies, even if they might not be visible in practice. In theory, they exist. Some of the result are similar with Seppänen, Penttinen, and Pulkkinen (2018) and Nurmi, Penttinen, and Seppänen (2019) who discovered low EA adoption rates in Finnish public sector EA. In this study, public agencies which have disciplined decision-making practices are higher in EA maturity. The leadership shows throughout the organization, and the strategy exploits the EA practices and purchases. Ross, Weill, and Robertson (2006) depicts that firm leadership is necessary when the organization aims to increase EA maturity.

All public agencies in this study have multi-professional procurement units or teams which standardize the purchasing practices. Again, a significant step in standardization attempts. However, the practices vary before the procurement proposal reaches the procurement unit or team. In lower EA maturity public agencies the IT department assesses the proposal before the procurement unit prepares the call for tenders. These agencies do not scan the resources prior to the project initiation.

Public agencies in higher EA maturities have decentralized project management, which evaluates the project resources prior to the project initiation, and before it reaches the procurement unit or team. Precise and detailed preparations in the pre-tender phase are necessary for the procurement success (Iloranta and Pajunen-Muhonen 2012; Kautonen and Nieminen 2019; Hayati, M.A., and Maharoof 2017). Furthermore, public agencies with top-down rules

in EA and firm leadership reach optimized core EA maturity.

In literature, the scarcity of top-down sponsorship hinders EA adoption (Seppänen, Heikkilä, and Liimatainen 2009; Hjort-Madsen 2006). PA3, PA4, and PA5 depict that the top-down support to execute EA principles is missing. Direct governmental ruling or ownership is considered an enhancer for agility in public agencies. For PA1 and PA2, the finding is accurate. Furthermore, cities and welfare organizations have lower EA maturities in this study. PA1 has characteristics of optimized core architecture; PA2 characteristics are moving from optimized core architecture towards business modularity architecture; PA3 has characteristics from the business silo, standardized technology, and optimized core architectures, and PA4 and PA5 have business silo and technology standardization architecture characteristics. Figure 3 presents the EA maturity stages in public agencies.
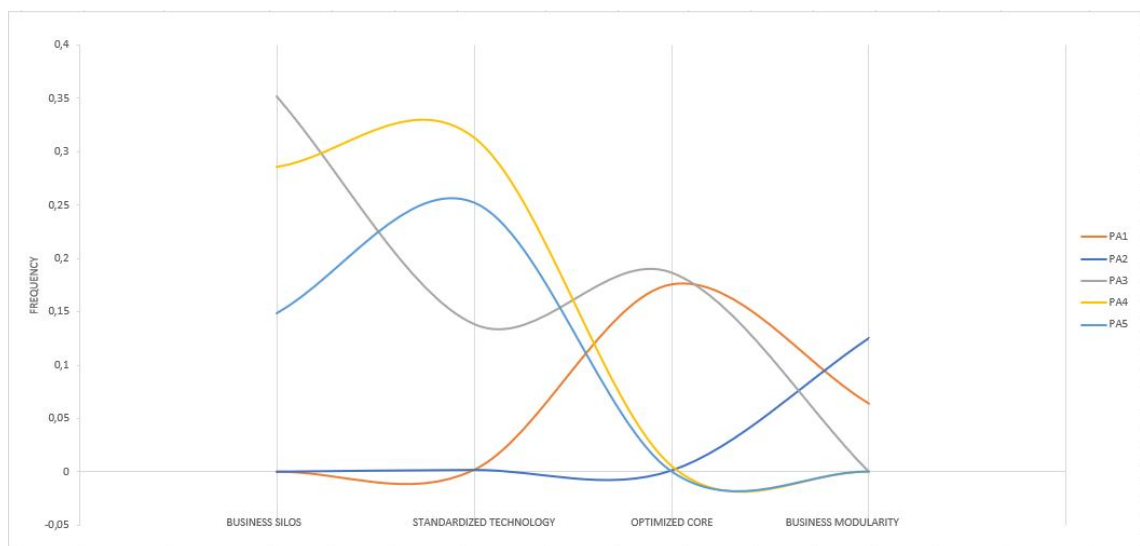

Figure 3. Enterprise Architecture Maturity Stages in Public Agencies

The established EA and project management practices seem essential for successful procurement. Ross, Weill, and Robertson (2006) holistic approach – IT capability, business objectives, funding priorities, management capabilities, IT governance issues, and strategic implications aid in determining the public agency's structure, practices, and strategy. In this study, it seems that the ICT procurement is more controlled in the agencies, which have higher EA maturities; projects are managed, and ICT procurement is considered as a task in a project.

Public agencies have varied approaches to observing tendering and reacting to market change. First, public agencies hold three different views on tendering practices, and all public agencies recognize one flaw in public procurement.

The first difference in views lies in the perception of public procurement. PA2, PA3, and PA5 depict that there is nothing fundamentally wrong with the procurement regulation - Act on Public Procurement and Concession Contracts (2016) only needs to be understood and used correctly. However, PA1 criticizes public procurement because the idea of lowering the price and enhancing the quality is bizarre, and the procurement practices guide the ridged software development model. Interestingly, the the issue has not been recognized in the literature. Furthermore, PA4 criticizes the procurement practices to be too strict to execute. Similarly, Baily et al. (2008) and Keränen (2017) consider procurement practices to be too strict, which affects negatively to the effectiveness of the procurement and ICT innovation.

The second difference in views on procurement activities is vendor selection. In practice, all public agencies recognize that sometimes the vendor selection happens before the tender phase, even if the incentive in law is to ensure fair and equal competition. Public agencies hold different views on it. In some agencies, the quality aspect is strong, and these public agencies aim to reduce the effect that the price has in the selection criteria. Pre-tender phase and preliminary market consultation is especially important in such evaluation. Furthermore, certain aspects are difficult to put in selection criteria, such as the vendor's ambition, teams' competence and vision. Therefore, if the preliminary market consultation reveals the most suitable option, which is not the cheapest, the public agency may encounter problems, if the criteria for the most advantageous offer is not defined properly in the call for tenders. Public agencies in higher EA maturity realize, that the selecting quality over price measures the expertise in purchasing. This could make the difference between success and failure in ICT procurement.

However, literature and some of this study's public agencies consider this a form of corruption. Corruption in Finland links to non-transparency, informal networks and rules, privatization, poor monitoring, incomplete corruption legislation, and ignoring attitudes towards norms or meaningfully misunderstanding them (Groop 2021). PA1 recons that public procurement fails in all its objectives, being equitable and non-discriminating, and choosing the

most advantageous offer. PA5 depicts a similar; sometimes, the ICT procurement favors only one vendor and lacks efficiency.

The third difference in views is the perception of the most advantageous offer. In this study, public agencies use open, restricted, and negotiated procedures in ICT procurement. Open and restricted procedures are the most common ICT procurement procedures in Finland (Holma et al. 2020). In this study, the participants depict that the procedure depends on what they wish to purchase. In a simple project, open and restricted procedures are adequate, but when the public agency is not clear about what it needs, the negotiated procedure might be a viable option. PA3 and PA4 depict that the negotiated procedure without the call for tender is the only option in deep vendor lock-in, and it is almost always an emergency solution. Both agencies recon that if they need to use negotiated procedure without a call for tender, meaning that the existing vendor continues with the development, something has gone wrong in the begin with.

PA1 and PA2 depict that using negotiated procedure without a call for tender is never an option. The vendor change must be done, even if the migration costs are high. In the end, it is inevitable. PA2 recons that evaluating the most advantageous offer links to the problem because it is tricky to define, and needs detailed attention at the beginning of the procurement.

In the interviews, public agencies recognized hinders in public procurement practices. The main hinder is in the pre-tender and tender phase, which affects to post-tender phase. PA3 and PA4 recon that ambiguous requirement definitions and inadequate preparation prior to the tender may result in legal ramifications, similar to the findings in Hayati, M.A., and Maharoof (2017). All public agencies are incentivized to predict future needs because the procurement is heavy, and the already existing good vendor may change due to tendering. Essig and Batran (2005) consider the mandatory tendering to cause non-lasting partnerships between the vendors and the public agencies. Inability to predict future needs affects the post-tender phase, where public agencies struggle to maintain a sustainable relationship with the vendor. The issue emerges from the mandatory tendering if something essential changes. All public agencies recon that it is almost impossible to predict future needs to the post-tender phase while tendering, and the demand is infeasible. Essig and Batran (2005) recon that the procurement regulation and the requirement to tender if something essential changes

prevents the sustainable partnerships between public agencies and vendors.

To summarize the current situation in Finnish ICT procurement, higher EA maturity links to organizational agility to react to the market through purchases (Ross, Weill, and Robertson 2006; Bradley et al. 2012). Public agencies with higher EA maturities have more innovative initiatives on where to spend and how to spend through tendering. Furthermore, these public agencies have decentralized project management unit which evaluates the project proposal before it reaches the procurement unit. Decentralized project management seems to be a significant control point. Furthermore, public agencies have three differences in opinions on public procurement. First, public agencies view public procurement differently; some find it too rigid and inefficient, and some depict there is nothing wrong with it. The second difference is in debate quality versus corruption; some agencies struggle to formulate vendor's soft criteria (ambition and vision) into selection criteria in the tender, and if it succeeds, other agencies perceive it as favoring a particular vendor. The third opinion difference is how the public agencies perceive the most advantageous offer. Public agencies higher in EA maturity recon that vendor lock-in hinders efficiency, and the more advantageous way is to change vendors even if it may generate costs. For those public agencies in vendor lock-in, the negotiated procedure without a call for tenders is the only option. Furthermore, public procurement hinders sustainable public agency and vendor relationships in the post-tender phase.

5.2   Threats to Validity

In this thesis, five public agencies participated, and seven interviews were done. The research method, semi-structured interviews, allowed the interviewees to depict what was significant to them to cover. However, this might be a weakness as well. Myers (2020) depicts that semi-structured interviews take the best parts from structured and non-structured interviews; consistency comes from the pre-selected themes and, on the other hand, from the freedom to specify and elaborate on subjects that emerge during the interviews. Hence, the research method fits the study, contributing to the research approach's validity. The data collection and analysis follows Myers (2020) and Charmaz (2006) grounded theory practices. Data is collected and analyzed systematically, in an iterative way, and rigorously, which makes the

study's reliability high. However, the sample size, five public agencies, and seven interviews may cause difficulties in generalisability (Noble and Smith 2015). However, the consistency in results and similar findings in the literature depict that the study has some validity even if the sample size is small. Myers (2020) depict that inner validity could be improved with triangulation or multiple researcher evaluation. In this research, the author solely makes deductions, which may infer the inner validity.

5.3   Related Work

Many literature sources name Ross, Weill, and Robertson (2006) research as a direction to follow in assessing EA implementation in public agencies (Bradley et al. 2011; Bradley et al. 2012; Olsen and Trelsgård 2016; Ajer and Olsen 2018; Dang and Pekkola 2017). Furthermore, the results are interpreted with Ross, Weill, and Robertson (2006) model and outcomes. However, the Ross, Weill, and Robertson (2006) EA maturity learning objective matrix is not used to evaluate the maturity stages in any other study than the original. Altogether, research on EA theories in practice is almost non-existent (Kotusev 2019). ICT procurement has been an interest in Nordic countries for some time (Iloranta and Pajunen-Muhonen 2012; Baily et al. 2008; Lähdesmäki and Kilkki 2008; Kautonen and Nieminen 2019; Keränen 2017). However, studies combining EA and ICT procurement as a practice to build sustainable IT to public agencies are almost missing. Setälä, Abrahamsson, and Mikkonen (2021) explore this view to some extent; the main issues in the field are recognized, and a viable solution is presented.

5.4   Future Work

In this study, intriguing topics emerged during the interviews. Public procurement issues are well-recognized in literature and practice. However, public procurement is explored in the literature as a separate function, not as a part of project management practices.

In this study, the public agencies with matured EAs considered procurement within the project management practices and as one task when the project was well-planned. In public agencies, the regulatory need to initiate procurement if something essential changes during

the post-tender phase are considered to be rigid, problem-some, and a cause for extra costs. Essig and Batran (2005) recognize the same issue. Need to procure when something essential changes creates pressure on the pre-tender and tender phases. Decentralized project management practices were inadequate in two public agencies in this study. These agencies recognized the need for project management practices to avoid wasting resources.

In future work, holistic exploration of the project management practices in public agencies seems a vital topic to cover. Furthermore, three public agencies depicted that leadership is inadequate, strategy is not manifested explicitly, principles to purchase are missing, and the EA establishment should be led firmly. This study indicates that public agencies lower in EA maturity are missing the organizational structures and leadership to establish coherent EA. Therefore, public agencies' leadership, management, and agility-enhancing organizational structures would need closer observations.

Public agencies in this study recon that it is almost impossible to predict all the future needs. On the other hand, public agencies wish to have an exit point if the vendor relationship is not optimal. In literature, it seems that the pre-tender and tender phases are well examined, but the post-tender phase receives less attention than the previous phases. In future work, if necessary, the post-tender phase concerning the agility change vendors would be interesting to cover. In some interviews, the in-house purchases seemed to cause issues. In-house procurement is not within the procurement regulation, which for the cooperation does not follow the standard practices which apply to vendors. The regulatory aim is to enhance efficiency in public procurement. These two aspects seem to hinder effective practices in this study.

6 Conclusion

This master's thesis aimed to examine the state of Finnish ICT procurement via EA and tendering. The interest was set to capabilities to react to the market change.

Literature on EA in the Finnish public sector states that the adoption rates are low. This study agrees and disagrees and suggests that more research on to topic is needed. Two public agencies out of five had established solid EA and agile operations. One public agency is reaching agility, and the rest of the two agencies struggle with rigid operations, even if the incentive is toward agility.

The leadership and top-down support for EA practices are highlighted; the more mature the EA, the firmer leadership and top-down support. Furthermore, all public agencies in this study have adopted one EA section; standardized purchasing. This study's public agencies use a multitalented procurement unit or team which prepares the call for tender. However, a hinder to agility lies in the practice before the procurement proposal reaches procurement personnel. Higher EA maturity public agencies have decentralized project management, which is missing from the lower EA maturity public agencies.

Furthermore, public agencies in this study have different interpretations on Act on Public Procurement and Concession Contracts (2016). Some public agencies seem to hold on outdated views on the law, which may lead to over-carefulness in vendor selection. In addition, in Act on Public Procurement and Concession Contracts (2016) shows that the sustainable vendor relationship is demanding to form.

These observations lead to suggestions to practice. Careful project preparation is vital in public procurement. Therefore, decentralized project management practices should be established in all public agencies. In this study, public agencies in high EA maturity stages tend to sum up at least development, implementation, and maintenance in one tender. Furthermore, these public agencies include development wherever they can. Summing up the software lifespan needs in one tender could be helpful in practice. However, it might need further research.

Furthermore, Ross, Weill, and Robertson (2006) EA maturity model is a promising tool to examine and enhance an organization's agility and capability to react to the market. Higher EA maturity public agencies in this study are developing innovative solutions and reacting to what is in the market. In addition, these public agencies do not have overlapping systems, data duplicity, or many vendors, which helps the management and enhances agility to react to the changes. In addition, the literature and this study show that the knowledge and fresh interpretations on Act on Public Procurement and Concession Contracts (2016) are inevitable acquiring agility to react to market change. Therefore, public agencies must observe and adopt the latest legal practices.

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APPENDIX 1: EA maturity literature review

Document title	Authors	Year	Findings
Elements of Sustainability for Public Sector Software – Mosaic Enterprise Architecture, Macroservices, and Low-Code	Setälä, M., Abrahamsson, P., Mikkonen, T.	2021	Mosaic Enterprise Architecture; the need for an enterprise architecture where separate services from different vendors are easily deployed and integrated; the aforementioned services must be built to interact via well-defined APIs, but with no need for direct access to other services; techniques need to support systematic and fast development and deployment.
Technology architecture as a driver for business cooperation: Case study - Public sector cooperation in Finland	Syynimaa, N.	2019	ICT-cooperation between eight municipalities and cities in Finland. Study reveals that even without business cooperation ICT-cooperation is possible. In future existing ICT-cooperation can enhance business cooperation. Hence, study suggests ICT-cooperation with other public organizations.
Enterprise architecture as a scapegoat for difficulties in public sector organizational transformation	Ylinen, M., Pekkola, S.	2018	Focus is to understand whether EA is the root cause for the tensions and paradoxes the IT department encountered in organizational transformation. Research reveals that problems do not originate from EA, but are associated with it. Organization has hidden tensions, which arise in EA implementation, because IT department role changes to be more ambigous.
Envisioning information systems support for business ecosystem architecture management in public sector	Valtonen, M.K., Nurmi, J., Seppänen, V.	2018	Research outlines structured and shared EA repository vision from the current state EA descriptions. Creates central design principles and functional requirements for EA system with use cases. Proposes EA for whole government as a concept for organizational design.
Method and practical guidelines for overcoming enterprise architecture adoption challenges	Syynimaa, N.	2017	Ea adoption rate and maturity are low, which results missing EA benefits such as cost reduction, IT standardization, process enhancement and strategic differentiation. Main hinder is that EA is not comprehended properly. Proposes Enterprise Architecture Adoption Method (EAAM) to minimize chanllenges in EA adoption.
Patterns of enterprise architecture adoption in the public sector: A resource-based perspective	Dang, D., Vartiainen, T., Pekkola, S.	2020	Recognizes three patterns for EA adoption and studies the impact of organizational capabilities in EA adoption.
Towards Ecosystemic Stance in Finnish Public Sector Enterprise Architecture	Nurmi, J., Penttinen, K., Seppänen, V.	2019	26 practitioners interviewed. Essential features for public sector EA are organizational capabilities, holistic view, co-creation and need-based utilization.

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Key Issues in Enterprise Architecture Adoption in the Public Sector	Seppänen, V. and Penttinen, K. and Pulkkinen, M.	2018	Identifies three key issues in enterprise architecture adoption; resistance towards EA, relevant EA goals, and EA practices in use
Enterprise Architectures in E-Governments Studies: Why, What and How?	Guo, H., Gao, S.	2020	Balancing technical factors and non-technical factors is important. Non-functional requirements may raise challenges. EA frameworks are important to some extend; evidence on government and city relevant requirements which are defined in a general manner.
Understanding challenges of applying enterprise architecture in public sectors: A technology acceptance perspective	Guo, H., Li, J., Gao, S.	2019	Technology Acceptance Model (TAM) used to identify seventy challenges in EA adoption. Challenges are reorganized to provide in-depth view and help practitioners to adopt EA in public agencies.
Enterprise architecture challenges: A case study of three Norwegian public sectors	Ajer, A.K.S., Olsen, D.H.	2018	Case studies from 18 enterprises and divisions in the health, higher education, and labor and welfare agencies. EA initiative has three challenges; autonomy of the units in the organization, national objectives and financial initiatives are not aligned, EA lacks understanding and holistic thinking. Institutional theory is used to offer indepth view to the EA implementation.
EA management in the German public sector: An initial perspective on priorities	Sonnenberger, A., Sandkuhl, K.	2018	Identifies weaknesses and strengths of EA in the public sector in Germany. Incompletely modeled technology layer is a weakness. Existing definitions, descriptions and models of enterprise objectives are strengths. Findings act as the foundation for defining future actions and recommendations to strengtheng the structures in place and building coherent architectures for public agencies.
Enterprise architecture institutionalization: A tale of two cases	Dang, D.	2017	Separate stakeholders drive EA projects to different direction and outcomes. Organizational structure shapes and influences by stakeholder relations. Research provides insigths for practitioners in public agencies on stakeholder behaviors and processes in EA deployment.
Enterprise Architecture Adoption Challenges: An exploratory Case Study of the Norwegian Higher Education Sector	Olsen, D.H., Trelsgård, K.	2016	EA in Norwegian higher education sector was studied. Findings are that progress impeds, because the high level directions from ministry are missing; interoperatible architecture council is missing and minimal competence in EA at organizational units and top level management.

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Danish eGovernment success factors: Strategies and good practice examples (Book Chapter)	Nielsen, M.M.	2011	Denmark is in the forefront to develop eGoverment. Research considers the strenghts for eqquiping Denmark to further digitalize. Goals, activities and strategies are well-developed; initiatives may entry from single point; development is attended ans aligned; enterprise architecture and common standards function; development, strategies, corporation and marketing are joined and the use of ICT is optimized by guidelines ans methodologies.
Enterprise architecture descriptions for enhancing local government transformation and coherency management case study	Valtonen, K., Mäntynen, S., Leppänen, M., Pulkkinen, M.	2011	The Finnish Government EA Grid is applied to Kouvola City concern. Provides insights in to organization transformation towards new public management operation models, government and IT-alignment, development of EA describing tools repositories for public agencies.
Stakeholders' views on government enterprise architecture: Strategic goals and new public services	Penttinen, K., Isomäki, H.	2010	Research reveals stakeholder perceptions on enterprise architecture development in Finnish Government. Findings are that EA work is seen technical, activities and contents should be emphasized more. EA interoperability is easier to develop for state administrations and ministries than in public agencies.
Key issues in EA-implementation: Case study of two Finnish government agencies	Seppänen, V., Heikkilä, J., Liimatainen, K.	2009	Research examines the root causes to establish succesful government EA. Reveals three set of factors which hinder EA to act as strategic alignment tool. Sets are 1) lack of EA governance, 2) development support is insufficient 3) resources to these are inadequate.
A framework for evaluating compliance of public service development programs with government enterprise architecture	Liimatainen, K., Heikkilä, J., Seppänen, V.	2008	Proposes a tentative framework for goverment enterprise architechture (GEA) to evaluate public service development program complience. The framework guides program initiatives with GEA perspective and has measures for quality assurance and monitoring. To enhance innovation, model proposes business modeling stage.
Management structure based government enterprise architecture framework adaption in situ	Valtonen, M.K.	2017	Dynamic data model for existing management stuctures. Considers EA as a strategic management tool.
Construction of enterprise architecture in discourses within the public sector	Lemmetti, J.	2016	Utilises critical discourse analysis (CDA) to examine EA in Finnish basic education system. Public sector officials have shared rationale and understanding of EA role to some extend, but officials do not understand or accept some concepts mutually.

APPENDIX 1: EA maturity literature review

Understanding enterprise architecture: Perceptions by the Finnish public sector	Lemmetti, J., Pekkola, S.	2012	Research on how Finnish public agencies have understoood the Act on the Direction of Public IT Governance. Understanding varies depending on the previous knowledge of EA and several misunderstandings appeared frequently.
Ambiguities in the early stages of public sector enterprise architecture implementation: Outlining complexities of interoperability	Larsson, H.	2011	Decision-makin roles and jurisdiction ambiguities between authorities must be clarified, and different ICT-perceptions should connect to overall goals.
Enterprise architecture implementation and management: A case study on interoperability	Hjort-Madsen, K.	2006	Interoperability challenges arise from non-coordinated IS initiatives in healt sector. Public hospitals do not share data and business funtionalities with other organizations. Therefore they have no economical or political incentives cooperate.
Architects' perceptions on EA use - An empirical study	Hiekkanen, K., Korhonen, J.J., Collin, J., (...), Helenius, M., Mykkanen, J.	2013	Finnish public sector perceptions towards EA work and initiatives. Higlights potential issues in succesful EA adoption.
Requirements for an architecture framework for Pan-European E-government services	Mondorf, A., Wimmer, M.A.	2016	Research on interoperability in pan-European e-government services (PEGS). Defines requirements for EA framework contruction fo PEGS.
A method to develop EA modeling languages using practice-proven solutions	Buckl, S., Matthes, F., Schweda, C.M.	2011	Presents a method to develop EA modeling language specific to the organization and applies EA modeling language in public sector practice.
E-government initiatives and information management in two local government authorities	Svärd, P.	2010	Succesfull e-government requires long-term overarching information management strategies.
Challenges for adoption of e-procurement: An SME perspective (Book Chapter)	Liljemo, K., Prinz, A.	2012	Examines SME's and e-procurement issues and challenges. Proposes requirements for e-invoicing architecture.
The role of services in governmental enterprise architectures: The case of the German federal government (Book Chapter)	Birkmeier, D., Buckl, S., Gehlert, A., (...), Schweda, C.M., Turowski, K.	2012	Proposes a method to translate business processes into services. Four steps.

APPENDIX 2: Interview questions

Interview for public agency

Personal data

- Education
- Job task / position
- Your current job started
- Getting started in the current organization
- Reporting responsibility to the CEO
    - Unless --> to whom
- Do you work on the organization's executive team?

Organization

- Organization name
- Department budget
- Number of employees

ICT vision

ICT's task in the organization is to:

1. Automate: ICT's role is to replace human work or at least change its productivity.
2. Inform up/down: ICT's role is to provide information to create a clear and systematic picture of the state, dynamics, and functioning of the organization, or the task of the ICT is to help workers at the operational level to gain a broader understanding of their own work.
3. Transform: ICT's mission is to fundamentally change the organization's operations through new ways of operating and services. The change is usually accompanied by a redefinition of customer and vendor relations.

ICT procurement

- Who/who decides what to tender
- Size of procurement
- What kind of dialogue can be conducted with suppliers before the tendering/tendering phase
    - Different ways of acquiring?
- Does the public tendering practice work
    - Good
    - Bad
- Tendering and reusability of systems
    - How to take into account
    - What tools to use

Financial point of view

- How to think about the most advantageous offer
    - What factors are taken into account
- How much the price affects the tendering process
    - Other scoring factors
- How to price
    - Project budgets — accuracy — keeping to the budget
    - Changes
    - Repairs
    - Maintenance
- Role of consulting firms
    - What is the role

APPENDIX 2: Interview questions

Life cycle

- With whom solutions are designed
- How long-term solutions are desired
    - How long to develop and keep on with the development
    - Life-cycle expectations, what affects

Systems and management

- What kind of systems or solutions are desired
    - Degree of preparedness of systems
    - Customized systems
    - Techniques
    - Updates
- UX
    - Whether system properties determine how the system works or vice versa
    - At what point does the user come along
- Control
    - Who manages the system
    - Who can make changes after deployment
        - Costs

Know-how

- Does the organization have the potential to manage systems internally
    - Is competence sufficient in the organization
- What/who is required and for what role

Commitment

- How to communicate with supplier representatives
- Who communicates
- Durations of contracts
    - Termination/termination/extension of contract
- How long the supplier usually continues to work on system development
- How to engage the supplier in the system process after competitive tendering
    - Incentives, fines