When Public Information System Procurement Meets Open Ecosystems: Experiences from Finland

Sinna Pirinen*, Samuli Pekkola and Tommi Mikkonen

Faculty of Information Technology, University of Jyväskylä, Finland

Abstract

Public sector organisations serve citizens and firms through networked services. Developing these services is a complex task, as all actors want to keep their data to themselves and not to share it with the others. In this paper, we present a case study on Finnish electronic health and social services, particularly its open data ecosystem called Kanta. We study how the characteristics of open data ecosystems: data, its sharing, cooperation, and their value, influence the public procurement of annexed information systems (IS). As the new system specifications are defined by the open data ecosystem and not by the procurement unit, the procurement is not completely managed by the procuring organisation. Our results suggest that utilising the open data ecosystem definitions has no direct impacts on the IS procurement project *per se*, but they solve some procurement challenges: the lack of expertise, understanding the target system, and complexity.

Keywords

public sector procurement, information system procurement, open data ecosystem

1. Introduction

Public sector organisations provide services to citizens and firms [33]. This service provision is in a flux due to changing political and economic environment, pressures to cut costs, and switching governmental management isms. The organisations thus try to exploit digital technologies, such as information systems, in their services and service provision.

To make this digital transformation possible, information systems (IS) use large amounts of data [12]. Often, open data is seen as means to utilise the organisation's external resources [4], [37]. The IS are developed in ecosystems where a group of organisations collaborate [25]. The ecosystem is thus not only providing the data but also creating shared value [1], [16] and promoting innovation [34]. The open data ecosystem concept emphasises data sharing through public licenses within software ecosystems [37].

The challenges of public IS procurement are well known [14], [30]. For example, acquiring large systems are often unique so the procurement unit may lack experiences. They may thus fail e.g. in eliciting the system requirements [27]. Public IS procurement is a complex process [17]. This means that when the governments promote digital transformation, they

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* Corresponding author.

sinna.e.pirinen@student.jyu.fi; samuli.j.pekkola@jyu.fi; tommi.j.mikkonen@jyu.fi

0009-0002-4047-3534 (S.E. Pirinen); 0000-0002-4245-0400 (S.J. Pekkola); 0000-0002-8540-9918 (T.J. Mikkonen)

seek international solutions and best practices [8]. This requires aggregation of public organisations, their digital transformation and IS procurement, and open data ecosystems.

In this paper, we study the relationship between an open data ecosystem, its characteristics, and the public IS procurement. We answer the research question: "How do the characteristics of the open data ecosystem impact on IS procurement in the public sector?" We present a case study of public procurements to the electronic social and health services (Kanta services) in Finland. We suggest that the open data ecosystem characteristics have no direct impacts on the procurement process from the laws and regulations points of view, but they help to cope with the lack of expertise and understanding the procurement target.

2. Background

2.1. Open data ecosystem

The creation, exchange, and use of data have evolved with technologies, leading to the emergence of data ecosystems where entities share valuable information [34]. Open data ecosystems have several characteristics contributing to their challenges and benefits [37]: value of data, relationships between entities, legal issues, data quality, data acquisition, maturity, value of collaboration and competition. This study focuses on three key themes: (i) political, legal, and cultural factors; (ii) lack and discrepancy of standards, and (iii) data costs. Figure 1 illustrates the open data characteristics in themes as they appear in the literature.

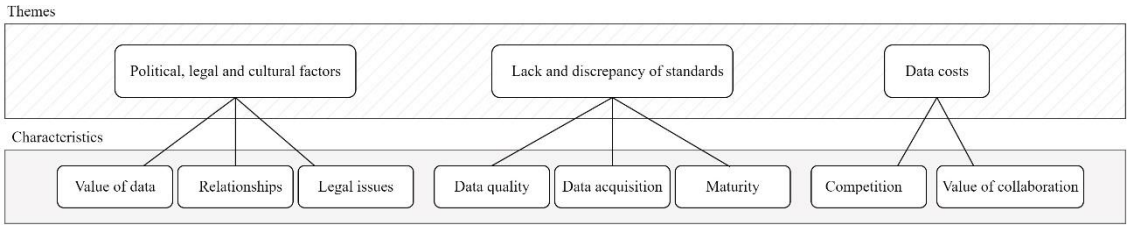

Figure 1 Open data characteristics in themes.

In **the political, legal and cultural factors** theme, the value of the data lies in understanding the business models and costs related to data collection and interpretation. The challenges with the value of data characteristics include mutual hardware and domain models, and explicitly clarified business value. The value of data characteristics can also help to uncover new market insights and end users [37], which can benefit decision-making and drive innovation within the ecosystem.

The relationships characteristics belongs to **the political, legal and cultural factors theme**. It refers to the relationships between actors in the ecosystem. The lack of communication between them causes challenges [6]. As building stable relationships between the actors can be difficult, it is essential to involve a trustworthy party, such as a public actor, to support the partnerships [37].

The theme also includes the legal characteristics, referring to legislation on data and licensing [37]. Legal challenges include the data producers' rights if the data contains personal information on users. The challenges are also ethical as individual data producers

should have the possibility to manage their own data [39] and know who is responsible for the system operations [6]. Different licenses complicate data sharing [20], [37]. There are also differences in legislation between countries, hindering cooperation [39]. The lack of political commitment can also hinder the development of common methods and standards [31].

The lack and discrepancy of standards theme includes the data quality characteristics. They focus on data quality and the factors impacting the quality. The challenges arise from the growing data volume, and its impacts on costs and quality criteria [37]. Validating the data quality is a challenge, with certifications and the limitations to import data into the ecosystem [19]. Sharing the costs and standardising the processes are beneficial [37].

Data acquisition includes data intermediary services and acquisition. It is part of **the lack and discrepancy of standards theme**. The challenges include the need for joint data collection. Resource disparities among actors can lead to variations in data quality [37].

The maturity of the ecosystem from the competence and standardisation point of views is also related to data standadisation. Maturity challenges include the lack of capacity and technical requirements in sharing the data. The standardisation of the processes is essential to ensure consistent data sharing practices [37]. Establishing standards early guarantee interoperability across various regions and countries [20].

The value of the collaboration is related to **the data costs theme**. It refers to the impacts that arise from different actors collaborating around the data [37]. For example, later joining parties often initiate new expenses as the data collecting and sharing costs may then rise [20]. Joining to an ecosystem also requires changes in the organisational cultures and processes [6]. In addition, some might not want to share their data as it can be seen as competitive advantage [37]. This causes data lock-in situations. Collaboration benefits however stem from the potential to create new markets, products, and services [37]. For example, cloud-based open data ecosystems offer opportunities for solutions that enhance the scalability and capacity of services [20]. Shared data collection costs enable smaller actors to join the ecosystem [37]. However, the open data ecosystems do not operate on exact reciprocity since the advantages arise indirectly through the systems [35].

The competition characteristics characteristics also belong to **the data costs theme**. It denotes the competitive dynamics among the data sharing actors in the ecosystem. Competition can cause concurrent activities and competition. Organisations may however complement each other's resources by promoting the creation of technological innovations [15].

2.2. Public information system procurement

The process of public procurement entails public sector organisations acquiring goods and services through the act of buying or purchasing. It involves the acquisition of necessary resources to meet the needs and objectives of these entities [18]. Rules and regulations are essential for organising public sector purchasing, distinguishing it from the more-free private sector practices [41].

Purchasing IS is different from other types of public procurements. The procurement unit must compare alternative solutions that work together with existing systems [29]. At the same time, these systems have significant impact on organisations' processes [38]. This

emphasises the importance of timely and coherent decision-making. In this paper, the public IS procurement is presented in two themes: the process orientation of procurement, and the procurement planning, vendor, and contract management complexity.

The public procurement processes are highly regulated. In the European Union (EU), the process is regulated by both the EU directives and national laws [30]. The EU directives aim to promote transparency, equality, and fair competition. The directives control the member states to act in accordance with national laws and obligations [7].

The procurement process typically has six phases. The first phase is the recognition of the procurement needs, followed by the call for tenders [17]. The call for tenders must be announced publicly, either nationally or across the EU, if its value exceeds threshold values. In open procedure, all vendors can submit their offers, while in restricted procedure the number of vendors is limited by the procurement unit [30]. In the open procedure, the vendors can ask questions from procurement units, but not negotiate [17] which takes place later in the negotiation phase. After the negotiations, the winning vendor is selected. The fifth phase starts with a procurement contract, followed by the acceptance phase [17].

Some challenges are associated with public IS procurement. Standard software is usually not suitable for the public sector, so the system is customised [40]. Large systems and their requirements are challenging to define, especially if the stakeholders have conflicting interests [2], [27]. In addition, public organisations often struggle with insufficient in-house expertise [30] and resources [2]. This leads to challenges with missing functionalities and system quality assessment [27].

Various technologies and integrations are essential in the IS procurements. It is critical that the technologies are compatible with existing architectures [36]. Despite careful planning, specifications, and negotiations, incompatibilities often emerge post-contract signing. [29]. Sometimes system compatibility result in vendor dependency and lock-in situations when the system switches are expensive. This means there is no de facto competition [5]. Competition can however be restricted in the public procurement process. The procurement unit must follow regulated procedures [28], which leads to long and expensive procurement practices at the vendors' side. As a result, smaller vendors may opt out or be left out due to financial reasons [29]. Also, standard contracts may limit vendor competition and reduce options [30].

Public entities adhere to regulations by focusing on the system selection rather than vendors. However, the vendor experience can be considered as a relevant criterium [30]. It has also been noticed that the procurement unit's capacity to produce highly specific specifications might preclude vendors from effectively demonstrating their capabilities [14], [29].

3. Research methods and settings

We study Kanta services, that comprise electronic social and health services in Finland [23]. Legislation enforces social and healthcare providers to upload the patient's health data to Kanta [23]. This means the provider's systems must be compatible with Kanta. Technically Kanta services form an ecosystem that includes myriad services [22].

In the public sector, the main developer parties of Kanta services are the Social Insurance Institution (Kela), the Finnish Institute for Health and Welfare (THL) and the Ministry of

Social Affairs and Health (STM). Kela is responsible for technical development, support, project planning and customer cooperation. THL serves as the preeminent authority in information management, being responsible for the requirements specification while STM is responsible for the funding, strategic direction and monitoring the results of Kanta services. In addition, STM is responsible for drafting legislation concerning Kanta services [24]. The social and healthcare enterprise architecture group (Sote EA group) at STM coordinates and guides Kanta information management [42]. Other public actors contributing to Kanta services are the National Supervisory Authority for Welfare and Health and the Digital and Population Data Services Agency. The former provides attribute and role services while the latter is accountable for the ID and certificate services [24]. In addition, numerous private healthcare and IT organisations have joined or contributed to the ecosystem.

Gaia-X is a European-wide initiative that builds a common data infrastructure to enable data flows across Europe, foster innovation, ensure compliance with data protection laws, and maintain trust through transparent standards [10]. Although Gaia-X includes various ecosystems [9], our focus is solely on the health domain.

We collected our data through semi-structured interviews by interviewing the main stakeholders. First, we contacted the enterprise architecture group (Sote EA group) to gain understanding about the Kanta services development. We then contacted Kela, responsible for the technical development of Kanta services and its public procurement. We then conducted interviews at the vendor side and in THL. Table 1 lists our interviewees.

Table 1 Interviewee information.

Interview	Position	Public/private
I1	Kanta specialist	Public, Kela
I2	Kanta development specialist	Private
I3	Kanta specialists	Public, THL
I4	Executive manager	Public, THL
I5	Kanta specialist	Public, THL

The interviews were held in MS Teams application due to Covid restrictions. They were audio-recorded and transcribed. The interviews focused on themes derived from grouping open data ecosystem and public IS procurement characteristics from literature. The questions also addressed the compatibility of the Kanta services with the open data ecosystem, using Gaia-X as an example.

We analysed the data through thematic analysis. The data was compared to the preselected themes. All occurrences matching with the themes were identified and selected as the descriptions of the theme. Altogether 105 instances (occurrences) were identified.

4. Findings

Our findings show that the interviewees were mainly concerned about legal, political, and cultural issues. The next most common themes were the procurement process, the complex-

ity of procurement planning, and supplier and contract management. The least focused answers were the lack and discrepancy of standards and data costs. Table 2 presents the themes and their descriptions in the order of their prevalence in the interviews.

Table 2 Themes and their descriptions.

Theme	Instance
Political, legal & cultural factors	Finnish national laws should be modified to enable Kanta's participation in the external ecosystem.
	Existing projects that aim to enable cross-border information exchange.
	The goals of information sharing would certainly work.
	Ethical challenges.
	Finding common consensus is slow.
	Challenges related to information and national security.
	Ownership related challenges.
Process orientation of procurement	The roles of Kela, THL and STM.
	The importance of the regulated procurement process.
	The impact of national regulations to the procurement process of Kanta.
	The procurements for Kanta services are not seen as direct procurements.
Procurement planning, vendor, & contract management complexity	Lack of procurement expertise and understanding of the target.
	Difficulty to plan procurements in the longer term for Kanta services.
	Common procedures are needed to maintain information security.
	Procurement units want to purchase systems from familiar vendors.
Lack & discrepancy of standards	The Gaia-X model addresses information security challenges.
	Gaia-X is not directly suitable for handling sensitive data.
	The data quality of patient information systems in Finland is disparate.
Data costs	Obtaining and processing personal data for publication is costly and inconvenient.
	Utilising data acquired with public funds would be beneficial.

The theme of political, legal, and cultural factors underscores the Finnish legislative framework as a significant obstacle in integrating Kanta services into an external ecosystem. Specifically, the Client Data Act and the monopoly on the secondary use of healthcare data were seen as the key factors. The interviewees agreed in unison that the legislation is currently the main barrier when considering the integration of Kanta services into an external ecosystem. I2 put this as follows: *"It [ecosystem integration] requires changes in the attitudes and laws in Finland. If we want to use health data, it should be completely possible."*

The findings illustrate also other projects with similar goals to health data, such as European Health Data Space (EHDS). With these projects, the European Commission obligates the EU member states to join an open data ecosystem. It compels them to ensure compatibility of their health domains with the EHDS and appropriate standards. The interviewee I1 described this: "*The European Commission is currently running the EHDS project where these somehow similar things are defined as in Gaia-X. The EU legislation is also defined here. It is thus possible that at some point of time, they are applied also to Kanta services."*

The interviewees argued that the goals of Gaia-X should be reasonable and aligned with the future information sharing needs. They experienced that the Gaia-X ecosystem facilitates information exchange in Europe, thus promoting the development of Kanta services. They mentioned ethical and security issues, and the fact that advancing shared development targets at the European level is very slow. The interviewee I4 had experiences from working in international projects. The interviewee stated that *"10 years is a really short time".*

The process orientation of procurement and the division of labour between Kela, THL and STM were emphasised in every interview. The interviewees said that Kela is making the final decisions related to technical requirements, technologies, and procurement decisions, THL is responsible for functional requirements definitions, and STM is responsible for funding and prioritisation. The roles were thus well-defined - in principle: *"STM and THL set the framework which Kela must follow. But the final decisions are always made by Kela." (I2)*

The interviewees however pointed out that sometimes such strict division of labour gets blurry: *"THL is responsible for the functional specifications. However, Kela is also making them sometimes". (I4)*

The procurement process unifies the procuring. Standardising roles streamlines the operations as the actors' potentially conflicting views are harmonised towards the common target. Also, when procuring various subsystems, the procurement process was regulated not only by the procurement target itself, but also by the procurement regulations and the national legislation. The interviewee I5 referred to national legislation: *"There are very detailed requirements that have to be taken into account and it takes resources."*

The complexity of the procurement planning, and the vendor and contract management reveal that utilising the open data ecosystem in the requirement specification phase could help in dealing with the lack of appropriate procurement expertise and resources. An open data ecosystem helps in defining the IS requirements, streamlines the requirement specification phase, and mitigates the impact of insufficient competences and understanding of the procurement target. The interviewee I2 expressed their concerns: *"There is no expertise to define procurement requirements that would reach the best outcome. And on top of that, we must deal with all sorts of vendor lock-in situations."*

The difficulty of long-term planning of Kanta services was a shared concern. The interviewee I4 expressed the funding challenges: *"In Kanta services, it is said that we have a far too short-sighted funding model. For example, you could handle it in a planned way and with a long-term vision. It should be managed systematically and with a long-term vision."* Currently the government set funding pace does not match with the purchasing needs. This complicates budgeting. If an ecosystem guides the Kanta service's development, it would also promote and secure long-term funding and procurement planning.

Concerns related to the lack and discrepancy of standards were evenly distributed. An open data ecosystem model, such as Gaia-X, aims to create common standards to information security. These common principles and standards were seen to help in considering the sensitivity of health data. However, the interviewees brought up that Gaia-X is not suitable in handling sensitive health data as it should not be published outside the Kanta ecosystem. Also, the data model was incomparable and unstable as such standards have not been used in Finland before. I2 stated that: *"The bigger problem is with these old-type [information systems], which the provinces still use. Those are not based on recording structural data, it's all in text format."* Thus, the uniformity in processes and standards ultimately affects the quality and incomparability of the data in Finland.

The data costs was the least prominent theme. Most occurrences emphasised the costs and discomfort in anonymising the data before publishing it in the ecosystem. The current legislation makes it expensive and time consuming to get hold of secondary data.

5. Discussion

Our findings suggest that to connect Kanta services to external ecosystems, they need to be obliged by the level of the European Commission. This aligns with Runeson et al. [37] who saw the public actor's involvement in the ecosystem is essential as they facilitate collaboration and act as a trustable party. Also, the benefits of joining the ecosystem were difficult to distinguish. This parallels with Gelhaar and Otto [13]: the actors usually acknowledge the benefits from joining an ecosystem but are hesitant due to the fear of revealing their data to their competitors. In our case, the concerns pertained to the dissemination of the citizens' personal data to unidentified entities in the ecosystem, raising apprehensions about potential data misuse. Due to these fears, the Kanta service specialists were against the integration to Gaia-X, the external ecosystem. Therefore, the European Commission's role in the development of the ecosystem becomes central since building trust among the actors and resolving challenges related to cultural barriers [3] is critical and time consuming.

The benefits from the ecosystem to the public procurement are obtainable only after a heavy process where the solutions are discovered, and the member states' legislations reshaped. This is in line with Runeson et al. [37] who argued that different regions and national legislations are a challenge when operating in the open data ecosystem. However, improved communication can help the actors to better understand different views on the procurement target. This would ultimately lead to better outcomes.

The ecosystem enforces standardisation and stabilises the public actor's roles and the processes. For example, when procuring Kanta service ISs, three public sector actors, Kela, THL and STM, were central. They had unaligned views on the needs and targets; Kela prioritised technical issues, focusing on existing infrastructure while STM had not scrutinised such concerns with equal precision in funding allocations. This supports literature on the challenge of conflicting interests between involved actors [27], [2]. The actors and their responsibilities were standardised up to some certain degree, although Kela occasionally participated in the requirement specification, not being their usual role. The literature does not consider whether changing roles are challenging or beneficial. Alanne et al. [2] however dis-

covered that when knowledge is distributed among the actor network, it necessitates cooperative skills to achieve desired outcomes. This notion, with the myriad specialists from various public sector agencies participating in the Kanta IS procurement, emphasises intensive collaboration and dependency on the individuals' capabilities to cooperate effectively.

Ultimately the actors are purchasing systems with similar specifications. This offers benefits in terms of increasing knowledge in the procurement units. Our findings suggest that currently the level of procurement expertise is insufficient in the public sector. The procuring units do not know how to elicit and specify the needs for the system they are purchasing (see also [2], [27], [30]). The lack of expertise is often seen as a challenge in the requirement specification. Pre-defined requirements reduce the possibility of human errors, which result from an insufficient level of expertise or communication between the actors. This is in line with Runeson et al. [37] that knowledge-sharing is as an enabler for achieving value from collaboration in the open data ecosystem. Sharing experiences across countries may increase the awareness of factors leading to successful procurement.

Increased knowledge-sharing may improve procurement planning or limit competition. This issue arises because the procurement regulations empower the units to impose restrictions on tender participants [30]. It is possible that selecting the vendors takes place before the tendering phase [14], leading to dominating vendors in the market [21].

Common requirement specifications are also an answer to the scarcity of resources in the procurement planning phase. Alanne et al. [2] has defined this as a challenge. Capitalising the ecosystem in the procurement planning phase, means that the actors do not need to use their resources on defining the procurement target. On the other hand, the procurement unit must still carry out the procurement process, i.e. the ecosystem does not directly eliminate the need for procurement expertise. It reduces the need for expertise and consulting related to the defining the procurement target.

An open data ecosystem guiding the Kanta service development helps in securing long-term funding and procurement planning. Currently they are short-sighted. The notion of goals of longer-term planning and its benefits are in line with previous research where both the procurement strategy and the long-term planning are seen essential to successful procurements [32]. In the future this will result in significant changes in Kela’s role as technical requirements would emerge from the ecosystem. This also poses the questions about ownership and responsibilities (see also [6], [37]). Our findings support Runeson et al. [37] observations about the significance of a legal framework to steer the actors in the ecosystem.

Both the sensitiveness of the health data and the common processes were not emphasised in the study. This was unexpected. Interviewees experienced the Gaia-X goals beneficial from the information security perspective, but they could not see the framework being suitable for storing and processing health data. Since the national legislation significantly influences the procurement process and the target, the open data ecosystem was not seen as an alternative. Despite the challenges related to the secondary use of health data, both its primary and secondary use [11] are to be supported via the Gaia-X ecosystem. With the Kanta services, the lack of motivation did not promote the secondary use of data. This is consistent with Vikström et al. [43], where the lack of motivation resulted from the challenges of the data anonymisation process, affecting also to the value of data.

When the open data ecosystem sets the public IS procurement targets, the data costs should be considered at the ecosystem level. The interviewees emphasised the costs and difficulty in obtaining data as the main challenges when trying to utilise health data for secondary purposes. As health data contains protected health information [26], it requires anonymisation prior to publication. This kind of data processing should thus be provided by the ecosystem. This supports the literature where one of the main elements in the open data ecosystem is to provide data processing tools [44].

6. Conclusion

In this paper, we presented a case study where the open data ecosystem characteristics are utilised in public IS procuring. We found that the integration of Kanta into the open data ecosystem relies on the European Commission's obligation, positioning it as a trustworthy facilitator within the ecosystem. This integration not only clarifies the roles among the parties in the IS procurement but also fosters cooperation. Moreover, leveraging the ecosystem during the requirement specification phase enhances procurement competences and reduces the resource needs. Lastly, the ecosystem supports long-term planning in terms of securing funding and enforcing strategic approaches.

The paper contributes to theory by examining a less-explored scenario – open data ecosystem characteristics and the public IS procurement. The intersection of these two topics have not been studied before. We thus contribute to research, in addition to small insights and notions, by providing a new perspective on literature. In practice, the study introduces possibilities to utilise ecosystem characteristics in the procurement context.

Our study has certain limitations. First, although we interviewed main actors, the number of interviews is very small. Only one interviewee was from Kela, the owner of Kanta services. In addition, only one interviewee was working in the private sector, so the vendor's perspectives are narrow. Additionally, the interviewees' roles regarding Kanta services were not considered. Therefore, the effects of the open data ecosystem characteristics on public IS procuring should be further studied from the vendor perspective, and from the procurement unit's point of view to enhance generalisability.

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