Technology Architecture as a Driver for Business Cooperation: Case Study - Public Sector Cooperation in Finland

Nestori Syynimaa
Faculty of Information Technology, University of Jyväskylä, Jyväskylä, Finland
Gerenios Ltd, Tampere, Finland
City of Ylöjärvi, Finland

Keywords: Enterprise Architecture, Technology Architecture, Cooperation, ICT.

Abstract: The current premise in the enterprise architecture (EA) literature is that business architecture defines all other EA architecture layers; information architecture, information systems architecture, and technology architecture. In this paper, we will study the ICT-cooperation between eight small and mid-sized municipalities and cities in Southern Finland. Our case demonstrates that the ICT-cooperation is possible without business cooperation and that ICT-cooperation can be a driver for future business cooperation. The findings challenge the current premise of the guiding force of the business architecture and encourage organisations' ICT-functions to seek daringly cooperation with other organisations.

1 INTRODUCTION

1.1 Enterprise Architecture

Enterprise architecture (EA) is a tool which can be used to manage enterprises in a holistic manner. It can be defined as a formal description of the current and future states of an enterprise, and a managed change between these states to meet stakeholders' goals (Syynimaa, 2015). As such, it can be used for analysing the enterprise, for creating scenarios, and for executing the selected strategy.

Typically, EA descriptions are produced for four different layers; business, information, information systems, and technology (The Open Group, 2009; van't Wout, Waage, Hartman, Stahlecker, and Hofman, 2010). The business architecture (BA) defines *why* the enterprise exists and *what* it does, such as, strategy, vision, mission, processes, and organisation structure. The information architecture (IA) describes all the information the enterprise uses, produces, and stores, including the information who can access the information. The information systems architecture (IS) describes the information systems used to process and store the information. Finally, technology architecture (TA) describes which technologies are used to build information systems.

The current premise in the literature (e.g., MITRE, 2018; The Open Group, 2009) is that each layer is guiding and constraining the layers below it, i.e., BA → IA → IS → TA. In other words, the business architecture sets the limits to all other layers.

EA is not limited only to a single organisation. In the context of EA, the enterprise is "any collection of organisations that has a common set of goals" (The Open Group, 2009, p. 5). This means that multiple organisations, such as the whole industry sector, may share the same EA, at least partly. The partial EA is often called a reference architecture. Good examples of reference architectures are the law, industry standards (e.g., SOA, HTTP), and best practices (e.g., ITIL, Scrum). Each of these reference architectures is adapted to best suit the needs of the enterprise, except for the laws and similar which are mandatory and thus implemented as-is.

1.2 Strategic Inter-organisational Cooperation

Organisations working in their industry sectors do not work in isolation. Instead, it is a network of current and potential collaborators (Child and Smith, 1987). By strategic cooperation, organisations seek, for instance, to enhance their productivity, to reduce uncertainties (both internal and external, to acquire

Syynimaa, N.
Technology Architecture as a Driver for Business Cooperation: Case Study - Public Sector Cooperation in Finland.
DOI: 10.5220/0007736206200625
In *Proceedings of the 21st International Conference on Enterprise Information Systems (ICEIS 2019)*, pages 620-625
ISBN: 978-989-758-372-8

competitive advantages, or to gain new business opportunities (Webster, 1999).

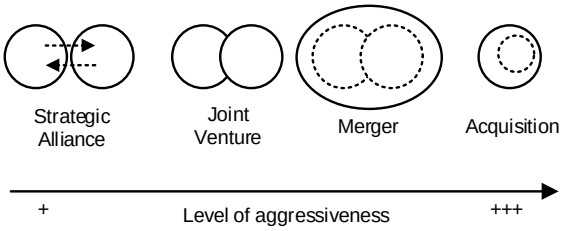

Figure 1: Strategic cooperation forms (adopted from Triandis, 1994).

Organisations can collaborate in many different ways as illustrated in Figure 1. Strategic cooperation is a strong mode of cooperation, which aims for long-term benefits. Figure 1 illustrates four different levels of strategic cooperation based on the aggressiveness or depth of the cooperation. The *strategic alliance* is a contractual form of cooperation, where "partners collaborating over key strategic decisions and sharing responsibilities for performance outcomes" (Todeva and Knoke, 2005, pp. 124). The *joint venture* is a "jointly owned legal organisation that serves a limited purpose for its parents" (ibid.). In practice, this means that a separate company is founded by one or more collaborating organisations. *Mergers* and *acquisitions* are the most aggressive forms of cooperation where "one firm takes full control of another's assets and coordinates actions by the ownership right mechanism" (ibid.).

1.3 Research Problem

In Finland, municipalities are part of the public sector, having the local authority to provide services to their citizens. Their services and obligations are defined in national laws, but they can quite freely decide how to provide and organise the provisioning of the services.

In this paper, we study whether the strategic cooperation in technology and ICT services could drive the local business cooperation in the context of small and mid-sized municipalities in Southern Finland.

The rest of the paper is structured as follows. The second Section introduces the case of local public sector cooperation in the Tampere region, Finland. The research methodology is described in Section 3. Section 4 provides an analysis of the case. Section 5 provides discussions and concludes the paper.

2 CASE: PUBLIC SECTOR ICT COOPERATION IN TAMPERE REGION

Tampere Region is located in Southern Finland and is the largest inland centre in the Nordic countries. The city of Tampere is the third largest city in Finland. Tampere and eight of its surrounding cities and municipalities, hereafter *the region*, have been cooperating in ICT and ICT-services for years. In November 2018, the region celebrated its 10-year ICT-cooperation anniversary (Porrassalmi, 2018).

The parties of the ICT-cooperation are listed in Table 1. Tampere is the largest city with over 230,000 citizens and 15,000 employees. The remaining eight cities and municipalities range from 4,500 citizens Vesilahti to 33,400 citizens Nokia. These eight municipalities and cities, hereafter *the circle*, have collaborated even longer than the region. The circle has 164,400 citizens and 10,200 employees altogether, so it is roughly ¾ of the number of citizens and employees of Tampere.

Table 1: The Regional ICT-cooperation Parties.

Municipality /city	# citizens	# employees
Tampere	232,000	15,000
Hämeenkyrö	10,500	550
Kangasala	31,500	2,200
Lempäälä	22,900	1,500
Nokia	33,400	2,000
Orivesi	9,300	550
Pirkkala	19,300	1,200
Vesilahti	4,500	200
Ylöjärvi	33,000	2,000
Total	*396,400*	*25,200*

The region's ICT-collaboration has two parties, the city of Tampere and the circle. Altogether the region has almost 400,000 citizens and over 25,000 employees giving it a strong negotiation power compared to its individual members. The circle has a joint CIO who represents all cities and municipalities of the circle towards Tampere and suppliers.

The regional ICT-collaboration is directed by a regional ICT-board, which makes decisions regarding the regional ICT-matters, such as competitive tendering for ICT and ICT-services. Currently, the region has jointly procured basic ICT. This includes Service Desk, life-cycle management of workstations and laptops, communication services (landline and mobile), networking, and capacity services (e.g., hardware and virtual servers).

The circle has its own ICT-board, consisting of the CIO and representatives from each member of the circle. The board makes decisions regarding the circle specific ICT-matters, such as projects and development budgets. As this type of cooperation is more interesting to study, in this paper we are focusing on the circle.

3 RESEARCH METHOD

Our research is a constructive case study (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 1994) where our aim is to understand what effect the ICT-cooperation has or could have to the business cooperation. The author works as a joint CIO for the circle. As the level of involvement of the researched organisations, we are following the practices of action research (Järvinen, 2018) although our purpose is not to intervene but to understand.

The data used in this paper was gathered between July 2018 and December 2018, and it consists of private discussions with stakeholders, meeting minutes, official records, strategy documents, agreements between the circle cities, and agreements with service providers.

We are using a defacto EA modelling language, ArchiMate (The Open Group, 2017), to describe and to analyse the ICT-cooperation.

4 ANALYSIS

4.1 Current Business Cooperation

In Finland, the municipalities and cities have over 600 tasks and almost 1,000 obligations defined in several laws. These tasks and obligations can be categorised under the following service areas (The Ministry of Finance of Finland, 2018):

- education and kindergarten,
- culture, youth, and library,
- urban planning and land use,
- water and energy production,
- waste disposal,
- environmental services,
- social and health services,
- fire and rescue.

Besides the statutory services, municipalities and cities can voluntarily provide services that are not mandated by the law.

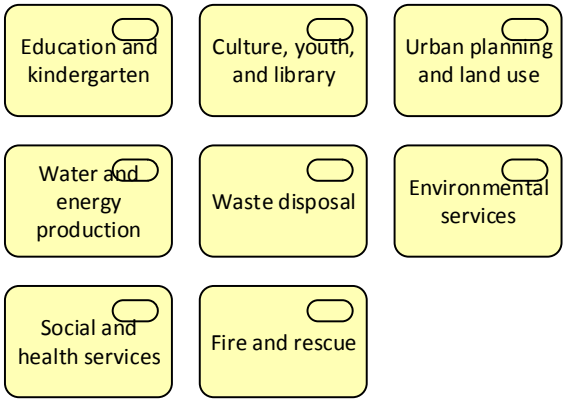

Figure 2: Statutory Municipality Services.

Currently, the service areas (SAs) does not have strategic cooperation within the circle. SAs, such as education, does have regular meetings between representatives of each circle member, but there are no contracts, nor shared budget or resources. This means that each municipality or city are providing their services individually.

4.2 Current Technology Cooperation

Technology related services can be categorised in various ways. National Institute of standards and technology of the United States (NIST) categorises cloud services based on service models and deployment models (Mell and Grance, 2011). Service models are Infrastructure as a Services (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Although IaaS, PaaS, and SaaS are commonly used only with cloud services, these service models can be used with all ICT-services if we add the On-Premises service model. IaaS includes physical and virtualised hardware, networking, and facilities. PaaS includes operating systems (e.g., Windows and Linux), middleware (e.g., web servers, portal servers), and database services. SaaS includes fully functional applications (e.g., CRM, ERP, and email).

ITIL defines a customer as “someone who buys goods or services” (Axelos, 2011, p. 20) and a user as “a person who uses the IT service on a day-to-day basis” (ibid., p. 64). Providers are “an organisation supplying services to one or more..customers” (ibid., p. 56). Customer’s responsibility for the components used to produce the service decreases when moving from traditional in-house on-premise services towards SaaS (Table 2).

Table 2: Shared Responsibilities for Service Models (adapted from Simorjay, 2017, p. 5).

Responsibility	On-Prem	IaaS	PaaS	SaaS
Identity & access management	C	C	C/P	C/P
Application level controls	C	C	C/P	P
Network controls	C	C/P	P	P
Host infrastructure	C	C/P	P	P
Physical security	C	P	P	P
Legend: (C) Customer, (P) Provider				

The general service provisioning model is illustrated in Figure 3. Service areas are providing services to citizens. ICT function provides software and infrastructure service which serves the citizen-facing service. Thus, the customers of the ICT function are the service areas. Also, most of the users are service areas, not citizens, except for websites and similar.

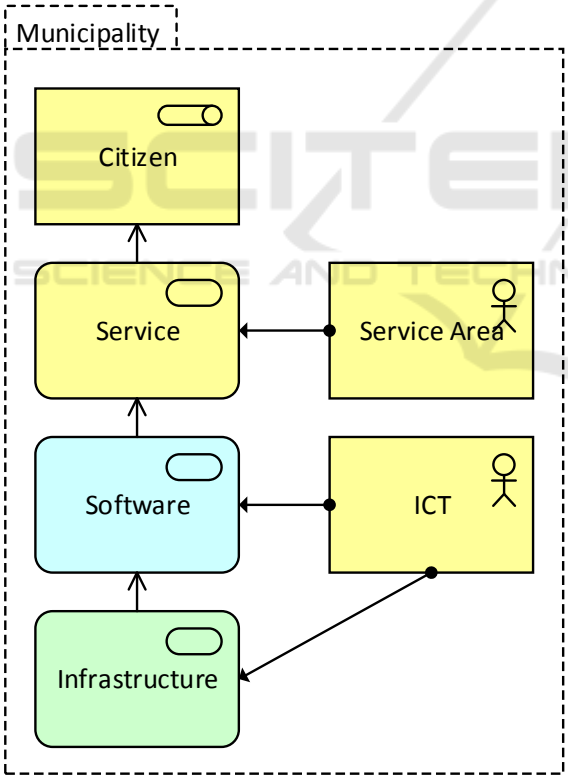

Figure 3: General Service Provisioning Model.

The service provisioning in the circle is illustrated in Figure 4. The circle provides shared services, which includes infrastructure services and email type of software services. Most of the software services used by SAs are still provided by the ICT function of each municipality.

The circle-wide cooperation is focused on IaaS, PaaS and SaaS. All basic ICT-services are provided by partners. This has lead to the situation, where the capability to provide on-premise basic ICT-services is no longer needed. This, in turn, has enabled the better usage of ICT-resources. Also, the cost savings on the unit prices have been remarkable due to the benefits of scale.

The cooperation model is a strategic alliance, where the basic ICT-services are voluntarily decided to be provided together. The cooperation is secured contractually between the municipalities and cities of the circle. The steering is organised through steering boards, as described earlier.

In the context of EA, the current cooperation in the provisioning of the basic ICT-services is implementing a regional reference architecture. This reference architecture includes all the shared ICT services: infrastructure and shared information systems.

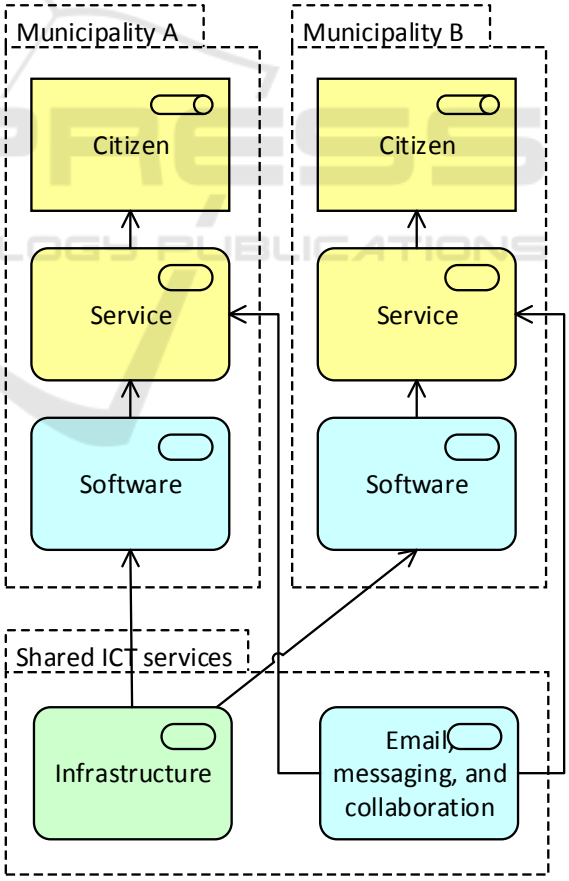

Figure 4: Service Provisioning in the Circle.

4.3 Findings

Business collaboration does require more than just basic ICT. The inconsistent technology architecture has been found to be one of the biggest barriers of collaboration in the public sector (Lam, 2005). In the circle, the shared technology architecture has enabled a new kind of collaborative possibilities. For instance, the shared network allows knowledge workers to access their services regardless of the municipality boundaries. The shared email and calendar allow people to plan and collaborate between municipalities. Finally, the shared video conferencing allows people to collaborate between municipalities regardless of time and space.

5 DISCUSSION

5.1 Conclusions

The current literature suggests that business architecture is the leading guidance of other EA layers. This means that also all cooperation and collaboration are defined in business architecture. Our case has shown that the cooperation between the ICT-functions of individual municipalities and cities led to the formulation of the shared technological reference architecture. Thus, organisations having their own individual EAs can cooperate on technology architecture even though there is no collaboration on other EA layers.

Shared technology architecture can also foster and encourage business cooperation by providing modern collaboration tools. With the shared technology architecture, the circle has achieved the 1st level, "Computer Interoperability", on the digital government interoperability maturity model (see Gottschalk, 2009). Next, the circle should focus on making their processes interoperable. This, however, requires strategic level decisions from the circle members.

5.2 Implications

Our study has both scientific and practical implications.

For science, our study shows that the current premise in EA literature, where business architecture defines cooperation boundaries, is flawed.

For practice, our study shows that ICT-functions can and should daringly collaborate to enable and drive business collaboration.

5.3 Limitations

The author of the paper has worked as a joint-CIO for the circle cities since July 2018. This provided us with the needed access to the case, but also may lead to the biased view to the case.

5.4 Directions for Future Research

Both the scientific and technical implications should be verified to address the limitations by studying similar cooperation in other industry sectors and geographical locations.

One interesting future area for research would study how the ICT-cooperation model could be implemented on other EA layers.

REFERENCES

Axelos. (2011). *ITIL® glossary and abbreviations* Retrieved from https://www.axelos.com/Corporate/media/Files/Glossaries/ITIL_2011_Glossary_GB-v1-0.pdf

Child, J., & Smith, C. (1987). The Context and Process of Organizational Transofrmation - Cadbury Limited in its sector. *Journal of Management Studies, 24*(6), 565-593. doi: doi:10.1111/j.1467-6486.1987.tb00464.x

Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review, 14*(4), 532-550.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *The Academy of Management Journal, 50*(1), 25-32.

Gottschalk, P. (2009). Maturity levels for interoperability in digital government. *Government Information Quarterly, 26*(1), 75-81.

Järvinen, P. (2018). *On Research Methods* Retrieved from https://learning2.uta.fi/pluginfile.php/712390/mod_resource/content/4/On%20research%20methods.pdf

Lam, W. (2005). Barriers to e-government integration. *Journal of Enterprise Information Management, 18*(5), 511-530. doi: 10.1108/17410390510623981

Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing. Gaithersburg, Maryland, USA: U.S. Department of Commerce.

MITRE. (2018). Enterprise Architecture Body of Knowledge (EABOK®). Retrieved from http://www2.mitre.org/public/eabok/

Porrassalmi, H. (2018). 10 vuotta Suomen laajinta tietohallintojen yhteistyötä. Retrieved from https://www.tampere.fi/tampereen-kaupunki/ajankohtaista/artikkelit/2018/12/04122018_1.html

Simorjay, F. (2017). *Shared Responsibilities for Cloud Computing*

Syynimaa, N. (2015). *Modeling the Dynamics of Enterprise Architecture Adoption Process.* Paper presented at the ICEIS 2015, LNBIP 241.

The Ministry of Finance of Finland. (2018). Kuntien tehtävät ja toiminta. Retrieved from https://vm.fi/kuntien-tehtavat-ja-toiminta

The Open Group. (2009). *TOGAF Version 9*. Zaltbommel, Netherlands: Van Haren Publishing.

The Open Group. (2017). ArchiMate® 3.0.1 Specification. Retrieved from http://pubs.opengroup.org/architecture/archimate3-doc/

Todeva, E., & Knoke, D. (2005). Strategic alliances and models of collaboration. *Management Decision, 43*(1), 123-148. doi: 10.1108/00251740510572533

Triandis, H. C. (1994). *Culture and Social Behavior*. New York: McGraw-Hill.

van't Wout, J., Waage, M., Hartman, H., Stahlecker, M., & Hofman, A. (2010). *The Integrated Architecture Framework Explained: Why, What, How*. Berlin: Springer.

Webster, E. (1999). *The economics of intangible investment*. Cheltenham: Edward Elgar.

Yin, R. K. (1994). *Case study research: design and methods.* (2nd ed.). Thousand Oaks, California, United Kingdom: Sage Publications.