Information System Implementation Model and Observations

Case Health Care, Social Services and Other Service Processes in Smaller Municipalities

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Abstract. Public sector in Finland is under heavy pressure to get more efficient and customer oriented. Information systems and their development is one possibility to improve municipalities' own processes and their service offering to the inhabitants. In this study we investigated what is the status of Information Systems in municipal governance and architecture management. The situation with systems landscape and architecture is, based on our findings, very scattered and municipals do not make their decisions, for example outsourcing decisions, in a systematic way.

Based on those findings, especially in small municipalities, we created a model, which municipal ICT responsible professionals can follow-up and use when improving their architectures and system landscape to be better planned and managed, also with lower costs.

Keywords: Public sector, information systems, architecture, modeling, outsourcing

1 Introduction

1.1 Agenda

The country of Finland, with current population of 5.4 million, consists of 336 municipalities. These are larger cities and smaller countryside villages. As the figures reveal, the majority of the municipalities are quite small in size. However, each is required to deliver the basic social and communal services to the inhabitants.

The social and communal services are supported with information technology (IT) enablers. The IT capabilities in the municipalities vary. The municipalities are independent in their decision making and IT services are both local and outsourced. The government encourages for co-operation between the municipalities and for nationally provided services.

In the County of Central Finland, as part of a public sector strategy creation work in autumn 2010 (Hyvönen et al. 2011), the county wide service process and IT services status were analysed. The results showed several opportunities for improvement and development.

Single municipalities in the Central Finland County are in a challenging situation. Costs need to be kept under control, process and service continuity needs to be ensured, the government presents new requirements. Shared services as those in health care provided by the central hospital require compatibility in processes and in IT. Municipalities need to maintain and improve the service processes and related IT systems and services with quite limited (operative) resources and knowledge and experience.

1.2 Research questions

This paper builds on two parallel tracks and on an analysis, presented in figure 1. The first track builds foundation from existing literature and models and proposes a method for the smaller municipalities to use in their coming decisions and implementations of information systems. The second track provides data and analysis of the current situation of information systems in the municipalities in the County of Central Finland. The analysis with findings and conclusions compares the current situation against the proposed model and proposes practical next steps.

By building on the assumptions that

- smaller municipalities are quite heterogeneous in comparison with each other, in the area of service processes; and
- smaller municipalities are guided, even forced towards more common information systems (IS) and technology (IT) to support the service processes;

the research questions of this study are:

- What are the key elements and capabilities in planning an implementation of an IS which a smaller municipality should consider? With special focus in decision making regarding the implementation.
- In which of these key elements the municipalities have biggest challenges and gaps?
- How can the municipalities overcome the challenges and gaps in practice when new IS implementation needs arise?

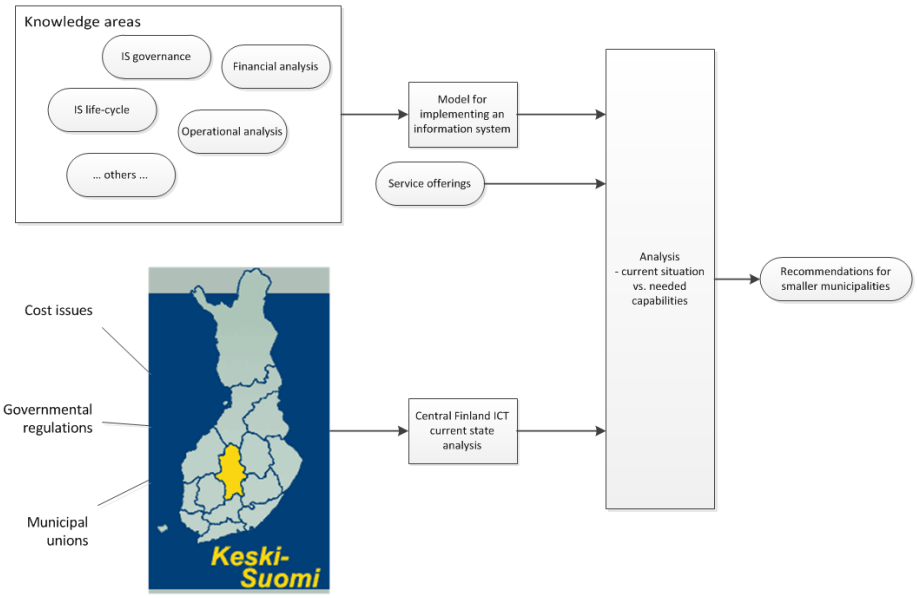

Fig. 1. The leading idea of the study

In the context of this study the term small municipality refers to 22 out of 23 municipalities in the county of Central Finland which are smaller in size than the city of Jyväskylä. Largest municipality in this class is Jämsä with 22 621 inhabitants (Väestörekisterikeskus 2011). In comparison to national level this definition of a small municipality refers to 293 municipalities (87%) of the total of 336. The small municipalities cover 37% of the total national population of 5,4 million.

2 Underlying theoretical framework

2.1 IT outsourcing

IT outsourcing has several definitions. In this study IT outsourcing is scoped to include the services which are sourced from external sources for the organization. In some cases outsourcing is usable when certain support functions can be delivered faster, with better quality or cheaper than own functions are able to do that. If tasks in question are not organization's core competences then those tasks are candidates for being contracted out (Lankford et al 1999).

Traditionally the key reason to outsource IS has been cost efficiency and savings. However during the last decade reasons have been more linked to strategy, availability for new technologies, competencies or speed. (Dibbern, Goles, Hirschheim, Jayatilaka, 2004).

Transactional Cost Theory (Williamson 1985) defines three dimensions why IT outsourcing happens. Those are transactions frequency, specificity, uncertainty. The

biggest reason to cause uncertainty is lacking information. In case a decision maker could know and handle all the available information the contract could cover all the coming issues. The longer is the contract the more uncertainty there is.

Information Systems (IS) have been created and operated traditionally by company internal IT organizations. Willcocks et al (2004) describes a model which is called "Do-IT-Yourself" (DIY). The potential benefit in this model is to keep easier control over IS but the risk with this model is that competency development is not developing and cost efficiency is not gained because of increased legacy. During the last two decades the outsourcing trends have been growing. The first outsourcing cases were mainly IT operations, such as computing, but Kodak Eastman started a new trend in outsourcing in 1989. IS outsourcing has been transforming to wider form and especially after year 2000 the entire business of business processes has been growing rapidly. For example Business Process Outsourcing (BPO) grew more than 25 percent per annum during 2002–2003 in the United Kingdom (Willcocks et al 2004) and that trend has been continuing.

2.2 Information system as a work system

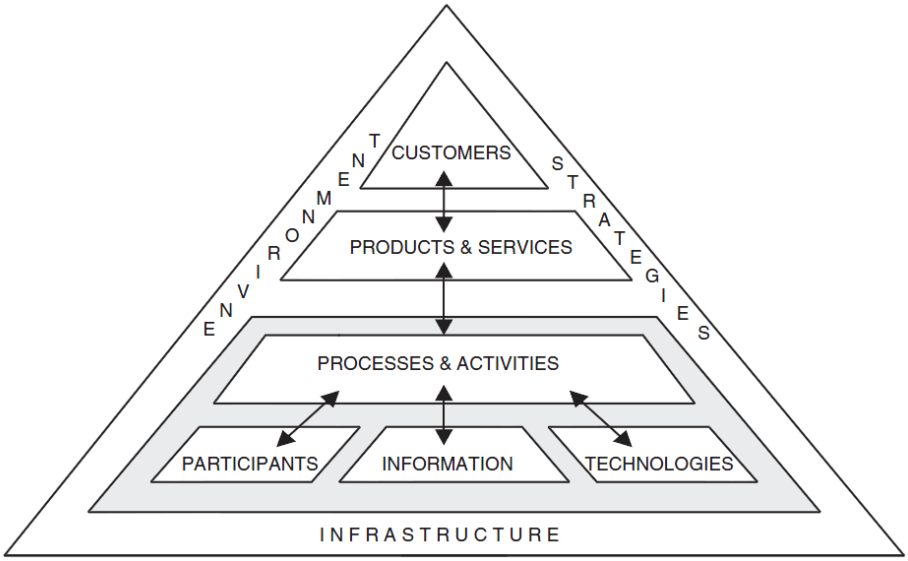

Fig. 2. The Information System structure (from Alter 2008)

The information system (IS) concept used in this paper as a foundation is built on the elements provided by Alter (2008). In Alter's model the information system is regarded as a case of a work system. The figure 2 presents the different elements of an information system, which are

- customers: the people who are satisfied with the information what the system produces
- products and services: the (value adding) product of the IS
- processes and activities: descriptions of how products and services are created
- participants: people with adequate skills who act as operators of the system
- information: the data in the system
- technologies: tools and applications of the system
- infrastructure: the generic information technology elements and networks
- environment: usually the organization where the system is placed and located
- strategies: provide guidelines and business level requirements for the system

2.3 Information system governance and life-cycle

A governance model provides a structure for linking the strategic management of information system with the business objectives of the organization, including the investment decisions.

A widely used framework in IS governance is COBIT (by ISACA) for establishing a set of information technology (IT) controls for different organizations' professionals to use. The COBIT model connects business objectives with information technology strategic levels, which are realized through IT development and operational domains. The COBIT framework is aligned with more detailed methodologies, such as ITIL (itSMF 2007), PMBOK (PMI 2008), CMMI and TOGAF (OpenGroup 2010).

Life Cycle Costing (LCC) refers to total cost of ownership. This way of calculating and estimating costs cumulating over investment life time refers often to total cost of ownership (TCO). This approach offers methods to estimate also other costs than capital costs of acquisition, such as maintenance, operations, ramp down and also business interrelationships to avoid the situation or errors in calculation, where low development costs may lead to high life time costs, e.g. in maintenance. LCC takes account of timing of cost flows and also includes cost risks (Norris 2001). Because it is critical but complex to calculate benefits during outsourcing life-cycle, some methods have been developed. PENG model (Dahlgren et al 2002) support decision making by calculating gross benefits, including direct, indirect and difficult valued costs are compared to of benefits. The calculated net benefit is the key to make the right decision.

Several models have been created for IS life-cycle management. In a model by Alter (2008) the basic structure of the life-cycle is iterative, containing phases from initiation, through development and implementation, to operation and maintenance. New needs for re-design will re-start the cycle.

For managing a portfolio of Information Systems, both design and operations, the IT Infrastructure Library ITIL provides a widely adopted iterative life-cycle model (itSMF 2007). The life-cycle evolves through stages of strategy to design, to transition, to operation. Each of the stages and the whole life-cycle has a built-in continual improvement element.

2.4 Information system requirements

Since strategies are the directions for business operations and the supporting activities in an organization, the existence and development of services enabled with the information systems should derive from these strategies. Referring to Heikkilä et al. (2011) the key requirements for the different service components in an information system can be defined in a logical way, in two main phases. These successive phases are (1) the analysis of the business model and (2) a closer operational analysis for each service component. Figure 3 highlights the key elements of these two phases.

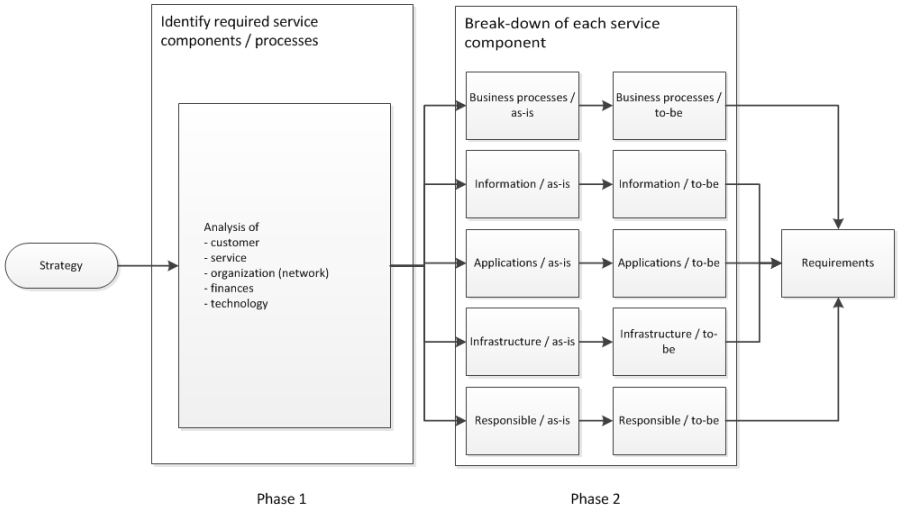

Fig. 3. IS requirements derived from the organization's strategy

The business model analysis of the strategy derives answers to a set of key questions. The analysis is made from a customer orientation view and covers the areas of

- customer
- service
- organization (network)
- finances
- technology

This is done by defining and breaking down the strategic elements into manageable targets and needs. From IS perspective the definition of required processes forms the basis for IS development and for IS delivery.

Our focus is in the service definition. For each business or customer segment a question of "What are the service components for the customer segment?" will be answered. In addition, across all customer segments, common service component needs will be recognized and noted.

In the operational analysis, each of the recognized service components will be analyzed for the current as-is and the required to-be status. Each service component is broken down in further detail levels of analysis, as shown in the table 1.

RESOURCE ORIENTATION	*Service component A*		*Service component B*		*Key Performance Indicators*
	As-is	*To-be*	*As-is*	*To-be*	
Business processes	What processes there are?	What processes there should be?	What processes there are?	What processes there should be?	Metrics for measuring the success in terms of strategic goals
Applications	What applications are used?	What applications are needed?	What applications are used?	What applications are needed?	Metrics for measuring the success in terms of strategic goals
Information	What information is available?	What information is required?	What information is available?	What information is required?	Metrics for measuring the success in terms of strategic goals
Hardware	What hardware/infra is available?	What hardware/infra is required?	What hardware/infra is available?	What hardware/infra is required?	Metrics for measuring the success in terms of strategic goals
Organisation	Who is responsible?	Who should be responsible?	Who is responsible?	Who should be responsible?	Metrics for measuring the success in terms of strategic goals

Table 1. Service component break-down (from Heikkilä et al. 2011)

The analysis levels actually define the layers of a typical Enterprise Architecture, such as TOGAF (Hirvonen 2005, OpenGroup 2010), with some enhancement to socio-technical areas in form of roles and responsibilities. The analysis also provides the requirements for further planning and definition work. The further work can utilize delivery methods such as EA Grid by Pulkkinen and Hirvonen (2005), and operational methods of project management as described in the next chapter.

2.5 Information system projects

Project mode is a typical working mode for implementing an IS (Standish 1995). This chapter shortly describes the characteristics of project work with focus on IS cases. The model builds on the reference from the Project Management Institute (PMI 2008).

Figure 4 presents typical core phases of a project. A project, by nature, is a temporary arrangement organized to achieve a set of target. Traditionally the focus in projects has been in the execution, in the “hard” back-end. However, nowadays the criticality of the “soft” front-end is gaining increasing importance (Morris 2010). Front-end is the initiating and planning part of the project where different options and analysis are evaluated and the readiness for actual execution is prepared. The front-end focuses in ensuring that the right projects will end up being executed, thinking of “doing the right things”. This phase of a project can be quite fuzzy since options can be many and risks difficult to evaluate.

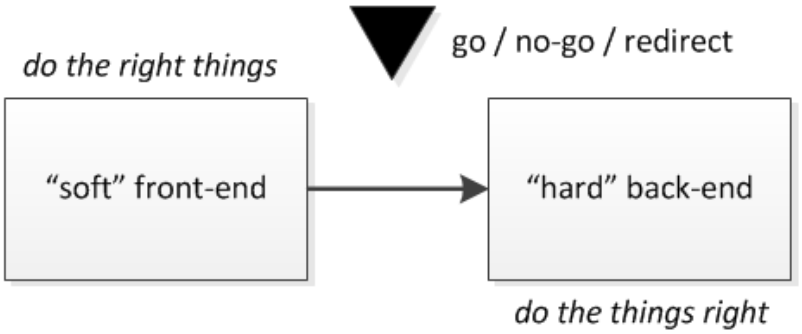

Fig. 4. Core phases of a project

The back-end execution phase (Figure 5) focuses in management of the actual delivery of the project, in the most effective and reliable way possible, thinking of "doing the things right". Problems will arise during the project execution, new possibilities will emerge, changes will happen. These will need to be handled, thus the plans and specifications will need to be maintained accordingly and the project work managed.

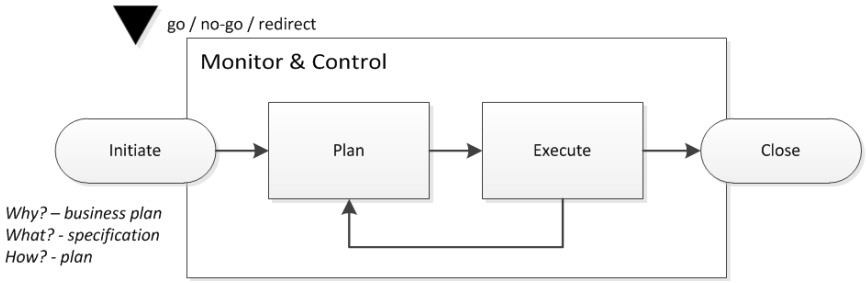

Fig. 5. Back-end of a typical project

As in any typical IT project, some critical areas require special caution to ensure project success (Johnson 2006, Standish 1995). Proper user involvement is essential in understanding the needs of the final end users and in preparing the users for the coming new system. Support and sponsorship from the executive management is critical in order to succeed in the project in general. The reason and need for the project needs to be identified, understandable and shared. The correct requirements need to be identified and the scope of the project shall be limited to fulfilling the requirements with optimized effort.

3 The empirical case study

In the study we researched 23 municipalities in Central Finland.

Multiple case study method (Järvinen P 2004) was chosen while collecting data. In our project we had no or little control over the phenomenon. Yin has described in his book (Yin 2011) that case study is a suitable approach when the key questions are "how" and "why". Both of these questions are valid to our study and to the targeted model creation.

3.1 Case Central Finland municipal ICT

3.1.1 Research process

We decided to use the eight step model by Eisenhard (1989) to be able to create a model to support our hypothesis in a systematic way. Firstly, we created initial research questions in broad terms. The second step was to define whether to include all the 23 municipalities or part of them. With help of our sponsor in the county, we ended up to include all 23 municipalities. The third step was to choose right protocols, a list of questions with criteria for interviews. As a fourth step an e-mail data collection questionnaire was created about municipals used applications for supporting the service processes. Step number five was to choose interviewees. In order to get wide enough data, interviewees were chosen to be municipals responsible IT manager or a person who was in other role but in charge of IT. After finding the right interviewees, researchers entered the field and most of the interviews were done face to face. For two municipalities the information was collected by using e-mail. Information about the applications was collected and reviewed by email. The collected data is qualitative and based on the answers of interviewed persons. In addition, IT application information was collected by using a form. Email was used as the primary means for collecting the data and reviewing it. Step number six was to analyze data using spreadsheets. The criterias and prioties to choose the most relevant findings were agreed between researchers based on their findings. When having data, we analyzed that and step seven was for shaping hypothesis and in step eight we searched articles and literature for finding the relevant existing theories. The last step was to close the study and finalize our paper.

3.1.2 Case data

Operational and financial data of the interviews was collected on a template including 78 questions. All the questions were defined and planned in beforehand to widely answer "why" and "how" a municipality has structured its IS. The questions are in MS-Excel spreadsheet format and the results were entered to the same document. When all the interviews were done, the results were analyzed using spreadsheets and a collection sheet was produced.

The collecting of the service processes and IT applications data was smoothened beforehand in face-to-face interview meetings by discussing, reasoning and motivat-

ing. The actual data was collected by distributing system data questions on an Excel spreadsheet. The data was transferred to an Access database, normalized and sent back to the municipalities for inspection. Different reports of the data were created and distributed to the participants for feedback.

In collecting the system data the focus was in identifying the applications which were acting as enablers in a number of service process areas. In addition general IT infrastructure information was requested, as well as information of possible external parties providing the service or support. The municipalities were also requested to list on-going or planned implementation projects.

The service process areas were selected as listed below. The list originates from a survey made by Sitra, the Finnish Innovation Fund (Sitra 2010), with an aim of compatibility in collected data.

- municipal office
- daycare
- school system
- technical services
- social services
- health care
- senior citizen services
- library system
- payroll services
- financial services
- desktop publishing
- electronic transactions
- other services

3.1.3 Summary of data

Operational and financial data

Finnish municipalities spending in their ICT (information and communications technology) is low with the ICT cost percentage of 0.92 % of their budgeted revenue while the average spending in most companies is three percent of their revenue per annum on ICT. Our study shows that 84% of the municipalities' annual spendings are directed to operating and maintaining the current systems. Municipalities can invest only 16% of their yearly ICT cost budget on developing new information systems, which is on very low considering high need to develop the municipal processes further.

Service processes and IT applications

The primary data exploited out of the collected IT system data was the application data. The IT system data was viewed with connection to the number of systems in the county and with connection to the size of the population in the municipality. The col-

lected general infrastructure data was not utilized. The result of collected development project data can be summarized with a conclusion that the municipalities had development projects of their own, and typically not shared with other municipalities.

No of systems	Application	Cov of population	Service process
22	KuntaNet	117700	technical services
18	Aurora	221200	library system
18	Pro Economica	108400	financial services
15	ProConsona	85300	social services
15	Primus	226800	school system
13	Pegasos	69100	payroll services
10	Wilma	86500	school system
9	Dynasty	85300	municipal office
9	Effica	205300	health care
9	ProConsona	70100	daycare
8	Basware	331200	financial services
8	Effica	190800	senior citizen services
7	Kurre	157600	school system
6	Abilita Vesihuolto	30200	technical services
6	Pegasos	39700	health care
6	MapInfo	24200	technical services
5	Effica	180500	social services
4	ProCapita	18400	school system
4	Pegasos	18200	senior citizen services
4	KuntaToimisto	147700	municipal office
4	Effica	165700	daycare
4	Peda.net	30100	school system
4	CMS	10000	desktop publishing
3	ProConsona	36400	senior citizen services
3	iManager	22500	desktop publishing
3	Xcity	159000	technical services
3	Web-sivusto	139700	electronic transactions
3	Pro Excellenta	34400	payroll services
2	Pegasos	6300	financial services
2	SAP	135100	financial services
2	Titania	3600	other services
2	Vesikanta	25900	technical services
2	Koki kiinteistöpito	30900	technical services
2	Effica	28400	other services
2	Web-sivusto	26300	desktop publishing
1	Jamix	2300	other services
1	Intime plus	9200	financial services
1	- unknown -	10800	electronic transactions
1	Facta	2300	other services
1	Prime	129600	desktop publishing
1	JD-Kustannuslaskenta	129600	technical services
1	GIS	10800	technical services
1	Facta	20200	technical services
1	Exchange	2600	other services
1	- unknown -	22900	library system
1	Apache, Joomla, MySql	20200	desktop publishing
1	Economa	20200	financial services
1	Elisa HelpNET	2300	other services
1	Kassapankki	20200	financial services
1	Comp	129600	financial services
1	Langaton Vaihde	2300	other services
1	Basware	3400	payroll services
1	Basware	3000	health care
1	AGS	20200	financial services
1	- unknown -	3400	technical services
1	Impressio	5500	desktop publishing
1	Sharepoint	129600	municipal office
1	SecretNet	20200	financial services
1	SAP	129600	payroll services
1	SSL VPN	7200	electronic transactions
1	Titania	10700	daycare
1	Pro Economica	5100	payroll services
1	ProConsona	5100	health care
1	Titania	4000	social services
1	Titania	800	payroll services
1	PlaNet	129600	technical services
1	- unknown -	1900	municipal office
1	Persona Regime	9200	payroll services
1	Koululiitu	20200	school system
1	Typo3	10800	desktop publishing
1	Pala	20200	payroll services
1	WinHIT	22900	health care
1	Workflow	9200	other services
1	Palvelukassa	129600	financial services
1	Mediatri	20200	health care
1	Media Cabinet	1600	desktop publishing
1	Lotus Notes	129600	other services
1	LIS	22900	other services
1	Sonet	20200	financial services
1	DL	5100	technical services
1	Personec	129600	payroll services

Table 2. IT applications in the County of Central Finland

The Table 2 presents the summary of the IT application data. For each Application two score values are presented. The Number of systems is a simple sum of occurrences for the application in the county. The same application can be in use in several service process areas and therefore the name of the application can appear several times in the table. Coverage of population sums up, for each occurrence, the size of the population in the respective municipality. This way the coverage describes the size of the population within which the application is in use. Service processes list the processes which the application supports.

Primary target for collecting the system data and analysis was to gain first time, even rough, understanding of the current situation across the county. The service pro-

cesses were assumed to be similar in municipalities since majority of the processes originate from legislation requirements.

Since the fields in the data collection table consisted primarily of free form fields were the names of the applications delivered in a variety of forms. This led to interpretation of the names and this led to using quite generic application names. Version differences and configuration variants were not studied – that can be done in the next phases of the study where a limited set of service processes may be studied in more detail. This interpretation led to lower granularity of the data, but the big picture in understanding the current situation was achieved.

The service process and application data presents that the variety of applications is large even when the underlying service process needs were very much the same. Another finding is that in the majority of cases the municipalities manage and operate the applications and underlying information technology by themselves, not sharing the service and its cost with another municipality.

4 Findings

This chapter presents the findings and consequent conclusions, based on the theoretical framework of chapter 2 and on the case study results of chapter 3.

4.1 Findings from the empirical case study

To build basis for answering the research questions the relevant key findings are presented here.

The overall findings of the case study in the area of operational and financial data show that ICT resourcing is not a strategic focus area for municipalities. We found in our study that only three of the 23 municipalities have clearly mandated professional in position, which is for managing and leading information systems in municipality. In smaller municipalities we did not get evidence that this kind of managing position exists. With this low level of resourcing the focus of the ICT professionals is very operative and is in installing and supporting the infrastructure and applications. Decisions to supply ICT solutions are done by other persons than ICT persons in a small municipality.

The other finding is related to investments for ICT in municipalities. The average investment to develop compared to operations is only 12 percent of the ICT budget. With that 12 percent investment municipals have to also execute the mandatory requests for changes, which they receive from government offices or ministries. The average of ICT investment is very low, only 0.92% of the overall budget. This is very low compared to e.g. with industry standard 3.5 - 4.5% of the total budget. This low level of ICT investment does not allow any bigger development steps in one municipality alone.

Only 3 of 23 municipalities have some documentation of their system landscape. We found architecture descriptions only in three bigger municipalities. These documentations were mainly lists of systems - architecture objectives descriptions did not

exists where e.g. integrations would have been documented. This kind of architecture documentation is a resource demanding effort and that is one reason why that had not been done. In one municipality ICT planner stated: “We do not have time to do any documentation, all the information is in my head”.

Though municipalities admit, that their processes should be very similar ones, they have only few common and shared applications in use. Those shared applications are such where some external from municipality is leading the function. One very well working application was for libraries but that is very small area. The largest one is for social and healthcare where regional healthcare organization has expanded their common application for social and healthcare processes during the last years.

The service process and application data presents that the variety of applications is large even when the underlying service process needs were very much the same. More than half of the different applications in use are used only in one municipality. In these cases supporting the service process area with a shared application would require change of application. The applications which are in use in several municipalities are still mostly local installations. With these applications the sharing of services could take place without a major tool change.

Only one municipality had done total outsourcing amongst the smaller 22 municipalities. They did not have any IT people in their organization. There were seven which had outsourced the main part of their infrastructure (incl. networks and servers). The rest had both applications and infrastructure operations hosted in-house. Some of the municipalities, especially in northern part of the county, had negotiated agreements with suppliers commonly but the rest had done outsourcing activities separately.

In our interviews with municipalities we did not find roadmaps or plans for the future, i.e. for 3-5 years. This kind of planning was remarkably missing in small municipalities. Also life-cycle cost management or planning was missing, according to our findings, which makes a systematic planning and fact-based outsourcing decisions difficult.

4.2 Method for smaller municipalities

The first research questions is “What are the key elements and capabilities in planning an implementation of an IS which a smaller municipality should consider? With special focus in decision making regarding the implementation.” To answer the question a method was created by pulling together from the theoretical framework of the chapter 2, focusing in the areas of findings of the case study of chapter 3.

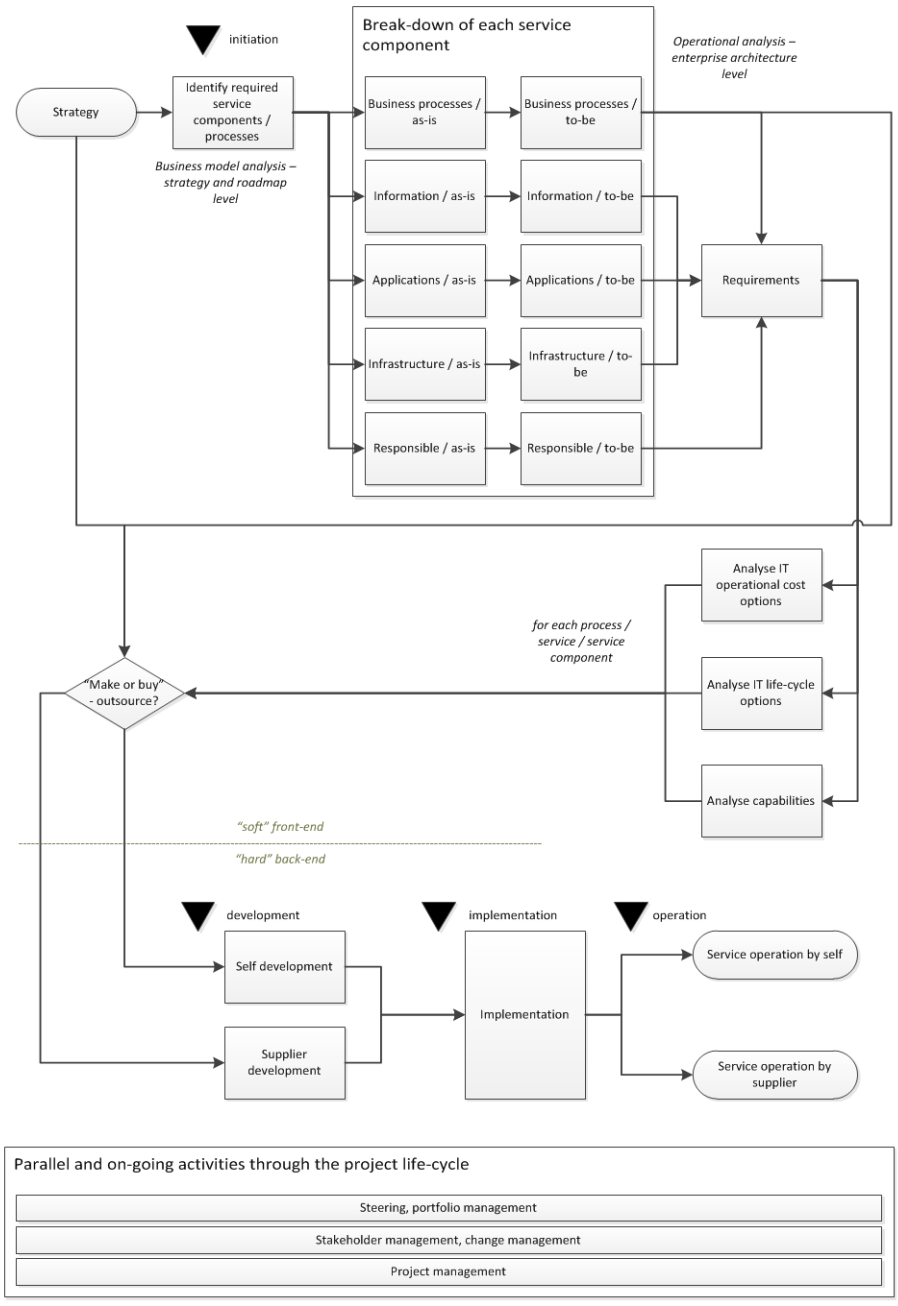

Fig. 6. Model for municipal Information System creation

The figure 6 presents the model which is created by summing up the previous chapters. The model is targeted for smaller municipalities, to provide one possible and practical way for identifying, selecting and implementing an information system.

The model proposes key activities needed in implementing an information system, leading from the organization's strategy to all the way through to the operation and use of the system. Key decision making points are identified and presented.

Parallel to the key activities lays a set of continuous activities. These have on-going characteristics; they are needed throughout the whole life-cycle of the information system creation. These activities include such activities as steering and portfolio management for the governance of the municipal IS.

The model builds on the assumption that needs for information systems raise from the organizations' strategies and support the organization's enterprise architecture (EA). Business model is a description of the strategy in practice. First step is to identify or review the required services and service components which are needed to support and realize the business model. Once identified, the service elements are broken down and analyzed. The analysis is made for the current state (as-is) and for the targeted state (to-be). The analysis areas are those of typical enterprise architecture, with additional emphasis in the people area for roles and responsibilities.

High-level requirements for the information system are derived from the enterprise architecture break-down analysis. The next step is to find out the mode of service creation and operation: "make or buy", that is whether to outsource (large or small) parts of the service creation and/or operation or not. The decision has a connection to the organization's strategy and to the nature of the business processes the information system is expected to support and enable. The analysis covers areas from IT operational cost perspective, across the whole life-cycle of the service, including as-is analysis and to-be calculations linked to strategic roadmap of the services.

According to the outsourcing decision the development of the system will be performed by the organization itself, by a supplier, or as a combination of these. Implementation can be supported by external parties but is always central for the organization itself; therefore the organization has the primary role in implementation. Service operation can be delivered, again, by the organization itself, by a service provider, or as a combination of these.

The IS creation projects or programmes can be several in an organization at a given time. The on-going projects form a portfolio which can be managed as an entity, ensuring resources and adequate management attention.

4.3 Findings in comparison to the proposed method

The second research question is "In which of these key elements the municipalities have biggest challenges and gaps?" The key elements refer to the model presented in the previous chapter. To answer the question the key elements are compared with the findings in the small municipalities.

The model builds on the strategy of the organization as the starting point in creating a new IS or updating a current one. The strategy is supported with a holistic system architecture and with an implementation roadmap. In the smaller municipalities,

according to the evidence discovered, these elements were not tied together, not all existing and primarily the strategy and related decision making dealt with single and separate IS decisions. Decision making focuses in budgetary decisions, holistic service process decisions are rare. IS development budget in general was minimal in the municipalities, as well as the management time allocated for it.

Evidence for enhanced requirements identification and development was not discovered. Typically the high level needs for the IS were identified and the details were worked out by the supplier and during the implementation work. Primarily the high level needs were governmental regulations.

Proper cost analysis from budgeting perspective was typically done covering the implementation and use costs of the IS. However, make or buy decisions were typically dictated by the very limited available own resources – thus pushing the decisions in the direction of subcontracting. Also since the holistic architecture and respective development roadmap were scarce was the cost analysis done quite narrow-sighted. Capability to study possible co-operation with other municipalities was typically very limited although exceptions existed and co-operation was done in form of shared services.

According to received information majority of the IS development and deployment work was done with a subcontractor or by the subcontractor. The range of subcontractors was wide, from international players to very local shops. This leads into losing ownership of critical information to the subcontractors and increases the challenges in managing the holistic architecture and related implementation roadmap.

The service operation phase was supplied both by the subcontractors and by the own organization and staff. In a typical case the first tier support was provided by the own staff and the second tier by a subcontractor or the application supplier. The evidence showed some but quite limited co-operation across several municipalities in sharing the service operation effort and cost.

4.4 Recommendations

The third research question is "How can the municipalities overcome the challenges and gaps, in practice, when new IS implementation needs arise?" Based on the findings and on the proposed operational model the following key points are suggested as focal points when improvements in IS implementations in the municipalities are considered.

The proposed model provides one solution for the whole chain of main events in the development and deployment chain. The municipalities can consider using the model very much as it is or adopt selected elements which are missing from their current practices.

In addition the following key points should be considered:

- high-level holistic architectures and development roadmaps – to better understand the big picture and connections across all the service processes
- in the IS requirements consider also the other municipalities – enable for the benefits of larger and shared systems

- consider the life-cycle costs in decisions of make-or-buy and co-operation – to improve cost structure
- consider co-operation with the other municipalities in general – to minimize re-inventing the wheel, to utilize the existing learnings and experiences

5 Discussion

The target was a practical study of the information systems in the smaller municipalities in the County of Central Finland. This was done from the systems point-of-view as well as from the operational and managerial views. Based on the findings and supported with a theoretical framework a practical but high-level model for operations was proposed. The current status of the IS operations in the municipalities was compared with the model and a recommendations were proposed.

The first research question of "What are the key elements and capabilities in planning an implementation of an IS which a smaller municipality should consider? With special focus in decision making regarding the implementation" was answered with the proposed management model. The model presents all the key elements and the related capabilities. The structure and the key elements of the model can be challenged and other options can be presented. However, we claim that the proposed model is practical, covering and feasible for use. It also provides all parties who are using it a shared language and process as a building block in co-operation.

The second research question is "In which of these key elements the municipalities have biggest challenges and gaps?" Gaps and challenges were identified by comparing the proposed model with the actual findings. These identified gaps were the bridge to the third research question of "How can the municipalities overcome the challenges and gaps in practice when new IS implementation needs arise?" As a solution a proposal of using the model was put on the table with some additional recommendations.

The studied topic and the proposed solutions are significant for the municipalities. The expectations for improved and lower cost operations are mounting up. An increase in co-operation is expected and therefore enhanced skills in managing IS development and a supporting model with shared language are needed. The academic significance of this study lies in applying a number of theories into one practice, thus testing the theories and recognizing potential new research areas.

The study was the very first of its kind in the county. The study was done as part of defining the ICT strategy for public sector. The current state of IS systems and operations was unknown and the first sweep in getting some overall understanding was needed. The results and data are numerous without a great detail but general understanding and a basis for further studies was reached. The study was a success and fully supported the strategy work and its approval.

Topics for possible further studies are several. The proposed model can be tested in practice in a selected service process area and validated and improved. The study can provide a current state analysis supporting planning of further co-operation across municipalities, covering areas such as architectures, roadmaps and life-cycle costs.

The model and the theories can provide tools for this work and the theories and their applications can be tested and reported.

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