

## **Modelling Contracting Procedure and the Concept of the Service Portfolio for Finnish Municipalities using SADT Technique**

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***Abstract.** The use of contracted services will increase in the Finnish municipalities in the next five years. The public sector finance is stricter than before. The public units have been forced to act like private firms in terms of efficiency and use of capital. The needs of this situation are cost-effectiveness and flexibility of service production. The municipalities are big property owners with many different kind of properties scattered widely inside the municipal boundaries. Aim of this study is to test use of the SADT technique in modelling the service production and contracting in the Real estate and facilities management of the Finnish municipalities.*

*The illustration technique used in this article, SADT (Structure Analysis and Design Technique) has been developed in 1970's. SADT includes the graphic language needed in the building of the system models, the technique how to develop these models, and a bunch of the organisational methods and utility tools. SADT model consists of a hierarchical entity of the diagrams. Every diagram, except the top-level diagram, describes a strictly bounded part of the problem.*

*The acquisition of the municipal real estate and facilities services can be divided in three main phases. The first phase is the decision on the municipal service strategy, the second phase is the implementation of the procurement, and the last phase is the service production according the strategies and decisions. Service portfolio is the selection of services used by the facility unit to support the core activities of the municipality. A typical service portfolio of a large municipality consists of 1-3 alternatives under each main production method. This means that the services to be managed are rather a matrix than a single alternative of the production method.*

*The process of contracting out is a process of continuous learning and accomplishments, and the mistakes made prove to be of a great help in the next process. Modelling the process with different techniques, for example SADT, is a tool to simplify the process for all parties working on it. It seems to be clear that SADT illustration is really helpful method in process modelling and it should have several advantages for municipal organisations in contracting although the future testing in real-life situations is needed.*

## **1 Introduction**

The use of contracted services will increase in the Finnish municipalities in the next five years. There are many reasons for this but one of the strongest is the age structure of the municipal employees – one third of all current manpower will be retired within the next ten years. Another big reason is the municipal economy. The public sector finance is stricter than before. The public units have been forced to act like private firms in terms of efficiency and use of capital. The needs of this situation are cost-effectiveness and flexibility of service production. The use of contracted services is a way to reach these goals.

Several different laws are controlling and regulating contracting out in the public sector in Finland. The main principles in the rules of procurement are that the purchases should be made on an open and efficiently competitive basis, and that suppliers should be treated equally and without discrimination. The municipalities are big property owners with many different kind of properties scattered widely inside the municipal boundaries. Hospitals, schools etc. require a wide scale of different services.

It is not an easy task to describe the contracting procedure in simple way due the variety of municipal property, different service production methods and the rules of public contracting. In this article, the SADT technology (Structured Analysis and Design Technique) has been tested in illustration of this procedure. Use of the SADT in this case has proved to be a tool in simplification of this complex system.

*“The feats of jujitsu seem unbelievable, until you realize that it is based on a science of pressure points and leverage, which allow all available force to be applied with maximum effect.”*

*Douglas T. Ross, creator of SADT technique*

## **2 Aim of the study**

Aim of this study is to test use of the SADT and related technique IDEF0 in modelling the service production and contracting in the Real estate and facilities management of the Finnish municipalities. The primary goal is to make a simple illustration of the procedure to help the municipal decision-makers in their duties in the different levels of municipal hierarchy.

### **2.1 Limitations**

The real estate and facilities services has been limited to the following services:

- Maintenance of the technical systems and the buildings
- Cleaning
- Waste management
- Care for the outdoor areas
- Maintenance of the special equipment: elevators, refrigeration and fire alarm devices
- User services

## **2.2 Research methods**

The study is a part of a wider research project "Ostopalvelut ja osaava kiinteistöjohtaminen kunnissa" (Contracted property and facilities services in the Finnish municipalities). The research was done 2001-2003 by Helsinki University of Technology (Laboratory of Real Estate Studies). The research project was divided in two parts. The first part was concentrated on the description of the current situation in Finnish municipalities and the second part on suggestions how to improve the current situation.

This article is based on the literature and legislation studies of the municipal contracting procedure and SADT technique. The procedure implemented in the second phase of the study is described by using the SADT.

## **3 SADT technique**

### **3.1 General overview**

The illustration technique used in this article, SADT (Structure Analysis and Design Technique) has been developed by SofTech Corporation (Douglas T. Ross) in USA. The first implementations of this technique were used in the software technology in the beginning of the 1970's. SADT includes the graphic language needed in the building of the system models, the technique how to develop these models, and a bunch of the organisational methods and utility tools. SADT can be either activity or data based and in general it is possible to describe every system by using the technique. Description language is all the time the same graphic system, which describes the results of the system work in clear and understandable form for both the users and the designers. (Pelkonen 1987, p. SADT-2.)

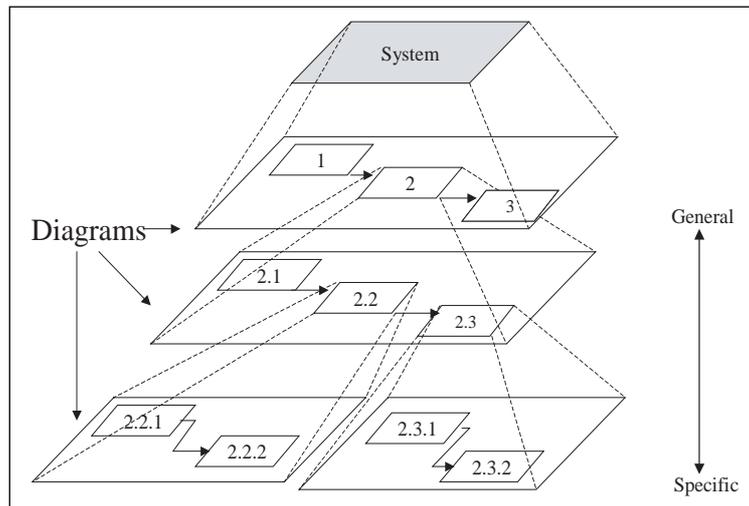
The problem-solving science behind Structured Analysis is based on the observation that the human mind can cope with any amount of complexity, as long as it is sensibly broken into manageable parts that assemble understandably to make the whole. Structured Analysis training, guidelines, checklists, methods, and notations allow people of all backgrounds to be more effective in understanding and solving problems, and presenting those solutions to others or using them for technical purposes. (Ross 1994.)

In the construction and real estate sector due the need for improved co-ordination of the interrelated tasks of numerous parties to the process, the means to focus on communication and interfaces and to manage the overall process have to be developed. Increase of the competition forces the companies and real estate owners to develop new products and forms of service. The management of the work is more and more important. (Karhu *et al.* 1997, p. 11.) While the SADT and IDEF0 have been used widely in the Finnish construction sector the implementations are not equally usable in the service production process.

### 3.2 Graphical illustrations

SADT model consists of a hierarchical entity of the diagrams. Every diagram, except the top-level diagram, describes a strictly bounded part of the problem. The diagram includes boxes and arrows and the information of the boxes are specified in the lower level diagrams. (Pelkonen 1987, p. SADT-4.) The formula of the model can be displayed graphically according the Figure 1.

Structured Analysis is deceptively simple. Anyone with almost no guidance at all can read and understand a *structured analysis model* – a neatly-organized sequence of simple “blue print” drawings, with supporting labels and texts, which present a top-down, gradual exposure of more and more detail about some subject of interest. There never are more that six new component parts on any one diagram. Each new part then is broken again into a few more parts of detail on another diagram. (Ross 1994.)



**Figure 1.** Example of the focusing of the illustration (Pelkonen 1987, p. SADT-4)

The basic models cover, for the chosen viewpoint, the *things* (real or symbolic – all are “data”) and the *happenings* (of, to, or between them) that, *together*, make up the whole reality. Thus for an organizational model the “things” might be people, committees, departments, jobs, memos, and manuals, while the “happenings” are their actions and interactions to achieve the objectives of the organization. For example, a computer program or an entire data processing system, data and activities clearly correspond respectively to the numbers, forms, databases, etc. and the instructions, subroutines, or system functions. For manufacturing, parts and production processes, whether manual or automatic, fit the same pattern. With the universal leverage point of *both* data *and* activities, Structured Analysis can make any subject understandable. (Ross 1994.)

### 3.3 Different SADT models

SADT model can be divided in activity and data models. Activity based model describes the activities as boxes and the relations between the activities as arrows. Data model describes the data as boxes and relations between the data as arrows. The targets of focusing (upper to lower levels) in the activity-based model are the activities and in the data based model the data. (Pelkonen 1987, p. SADT-5.)

In this article only the activity based diagrams are implemented.

IDEF0 is a subset of the SADT method and it is a public domain modelling system and in fact it is an American standard (FIPS 183). IDEF0 can be used to produce structured documentation suitable for ISO 9000. (Bisoft 2004.)

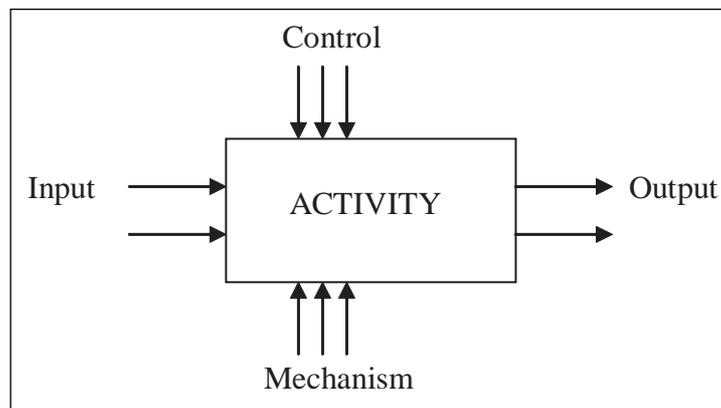
### 3.4 Use of the SADT

The arrows inbound to the boxes describes every action required to fulfil the task (activity). The activity can be only performed if the previous activity has produced the required input (Figure 3). (Pelkonen 1987, p. SADT-8.)

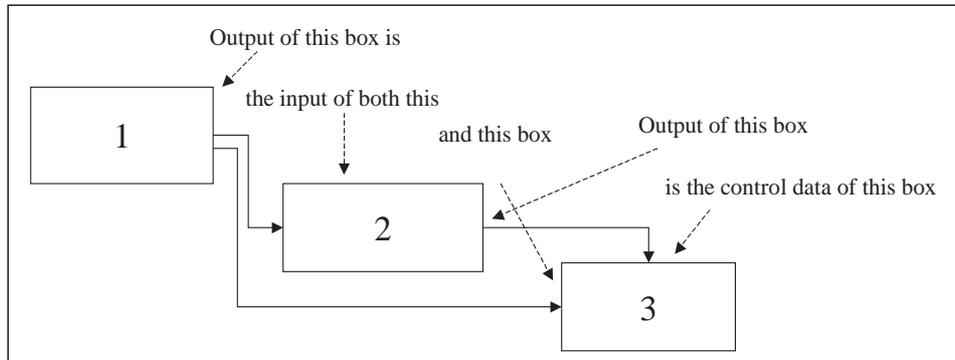
SADT diagram includes four different kinds of arrows (Pelkonen 1987, p. SADT-5.):

- Input
- Output
- Control
- Mechanism.

Input arrows come to the box from the left side and the output arrows leave from the right side. Control arrows come from the above the box and mechanism arrows below (Figure 2).



*Figure 2. Activity box (Pelkonen 1987, p. SADT-8)*

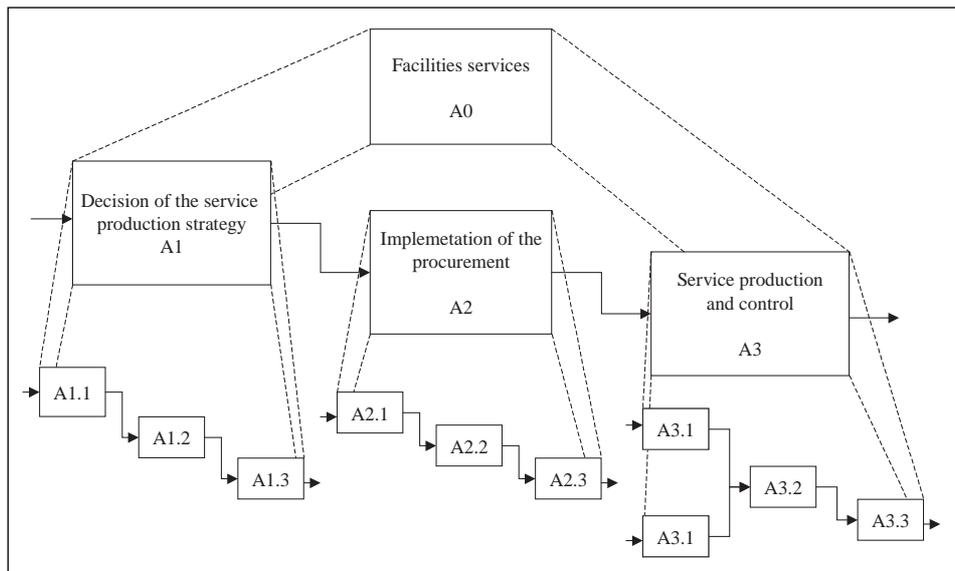


**Figure 3.** Relations between the activities described with the arrows (Pelkonen 1987, p. SADT-8)

The place for every diagram in the model is specified with certain identifier. The numbers in the boxes determines the identifiers. For example A21 is the diagram, which specifies the box 1 in the diagram A2. Respectively diagram A2 specifies the box 2 of the diagram A0. Diagram A0 is always the top-level diagram. Letter A is used in front of the identifier in the activity diagrams and D in the data diagrams. (Pelkonen 1987, p. SADT-12.)

### 3.5 Use of the diagrams in this article

The diagrams of this article are divided in three levels. The top-level diagram, the facilities services of a municipality, is described with diagrams of three boxes (A1-A3) and these boxes are described with subordinate diagrams A1.1-3, A2.1-3, and A3.1-3. Hierarchy of the diagrams in this article is clarified in the Figure 4.



**Figure 4.** Hierarchy of the diagrams (Siltala 2003, p. 14)

#### 4 Value chain of the municipal services

The acquisition of the municipal real estate and facilities services can be divided in three main phases (Figure 5). The first phase is the decision on the municipal service strategy, which makes the guidelines of the service production methods. The second phase is the implementation of the procurement, which is mostly labour taking job of creating the tendering documents, arrangements of the tender and evaluation of the candidates. The last phase is the service production according the strategies and decisions made in the earlier phases.

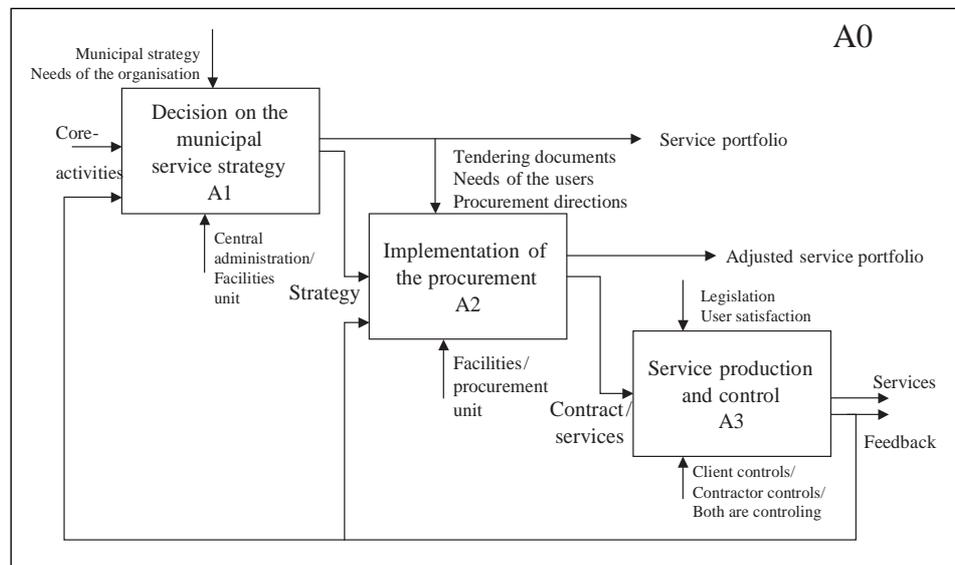


Figure 5. Description of the top-level box (Siltala 2003, p. 18)

#### 5 Municipal service strategy

The Finnish Association of Municipalities (2003) has declared that every municipality should create a municipal service strategy, which clarifies the general strategy of service production and management for the next ten years. In addition to the development of the in-house service production the municipality should seek the possibilities to use the alternative methods. One goal is to develop the co-operation between the parties of service value chain. The municipality should improve its strategy on the basis of the user satisfaction, and the changes in the supply and demand atmosphere should be taken into account. In general, the municipality can improve the service production in three different ways:

- Developing the in-house production
- Co-operation between the municipalities
- Contracting out.

The end product of the service strategy is the *service portfolio*, which is the selection of service production methods used by a municipality (Figure 6).

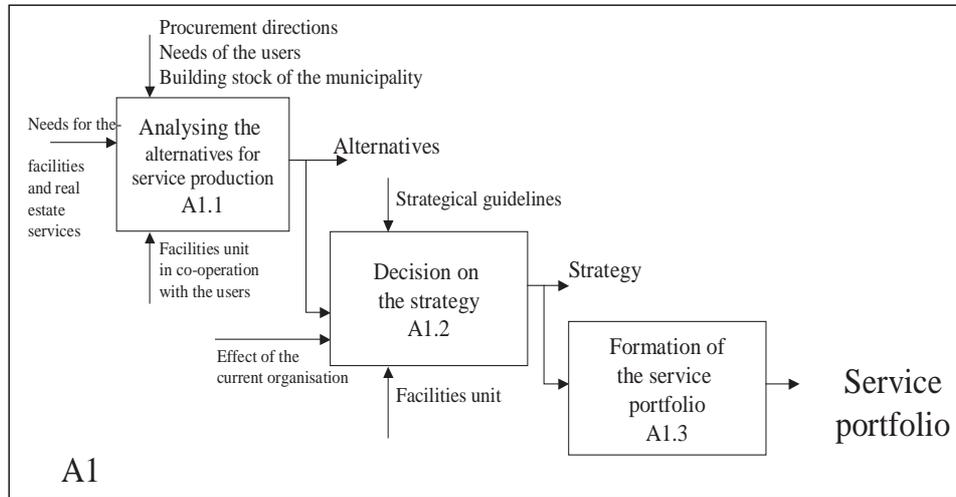


Figure 6. Description of the diagram A1 (Siltala 2003, p. 24)

### 5.1 Relationship between the owner and user of the facilities

*Facility unit* is the basic unit of municipal real estate and facilities management. It is responsible for the management, care, and maintenance and renting of the space administered by the municipality. Facility unit rents the premises to the administrative branches of the municipality (internal rent) as well as to external users (market rent). Facility unit makes the contracts in the name of the central administration of the municipality (Figure 7). If the in-house client-contractor model is implemented, the municipal owned producer unit (the contractor) should be treated like the private service provider firms. (Siltala 2003, p. 27.)

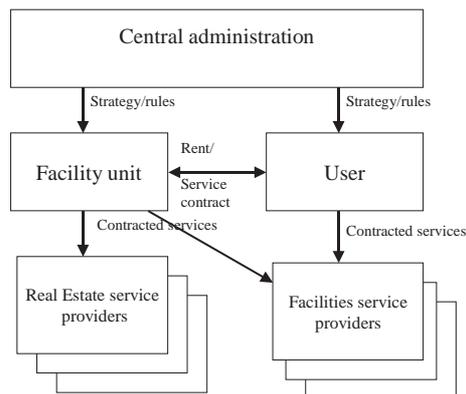
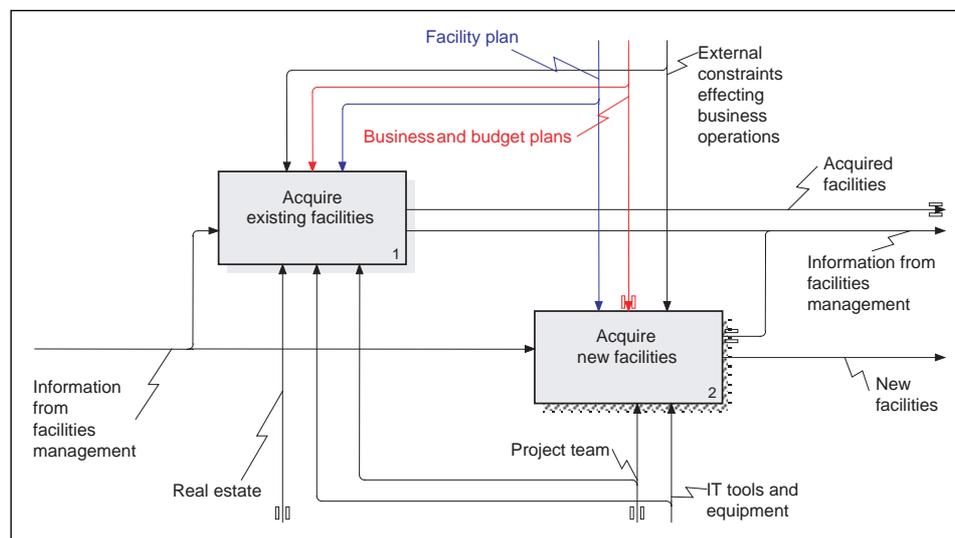


Figure 7. Relationships between the owner, user and facility unit in the largest Finnish municipalities (Siltala 2003, p. 28)

## 5.2 Service portfolio

Service portfolio is the selection of services used by the facility unit to support the core activities (the users of the facilities) of the municipality (Siltala 2003, p. 29). Service portfolio includes (Figure 8):

- *In-house production of services* (work by own organisation, client-contractor model, public utility and municipal company)
- *Co-operation between the municipalities* (networking, joint organisations and federations of the municipalities, joint companies)
- *Contracting out* (single services, packaged services, total FM and outsourcing)
- *Public-private partnership models* (for example private finance initiative PFI).



**Figure 8.** Structure of the service portfolio (Siltala 2003, p. 29)

A typical service portfolio of a large municipality consists of 1-3 alternatives under each main production method. This means that the services to be managed are rather a matrix than a single alternative of the production method. In a unit size of a municipality it is virtually impossible to find a single one 'fits for all' solution without risking the economical independence of the municipality.

## 6 Contracting procedure

The goal of the public procurement legislation is to upgrade the efficiency of procurements in the public sector and in so doing boost the effectiveness of the use of public funds and improve the opportunities of companies to offer their products and services to the public sector. The main principles in the rules of procurement are that the purchases should be made on an open and efficiently

competitive basis, and that the suppliers should be treated equally and without discrimination. (Public procurement act 2003.)

Tendering procedure is one of the most labour using and significant phase in the contracting, but successful tendering is vital for the satisfaction of the service users in the future. Quality management is also an important part of the preparation. The first task is to define the targets to be measured (for example usage of water, user satisfaction, level of cleaning). Then the selection of proper gauges, which will be used in the measurements, should be chosen and how the measurements are practically done. Meetings with the user/client and contractor, co-operation and learning are the important part of the quality management. (Siltala 2003, p. 40.) (Figure 9.)

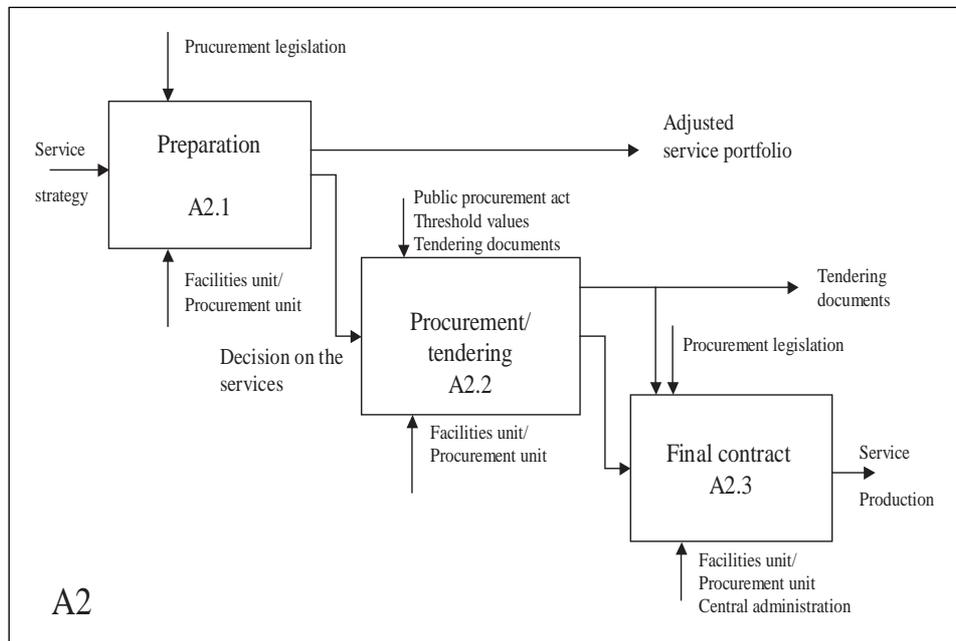


Figure 9. Description of the diagram A2 (Siltala 2003, p.34)

## 7 Control during the term of the contract

Control of the fulfilment of the task is an important part of the contracting out procedure. The purpose of the controlling is to monitor the quality of contracted work and improve it. The contracted work should satisfy the demands of the owner, management, user, and the contractor. Tools of the monitoring are mostly defined in the contract, and one of the most important parts of the contracting procedure is to ensure the proper possibilities for the control of the work. (Siltala 2003, p. 49.) The basic tools are user satisfaction surveys and meetings between the parties. (Figure 10.)

### 7.1 Evaluation after the contract

After (or at the end of) the contract period the managing organisation must benchmark the achievements of the contractor with the collection of the satisfaction surveys, meeting memos or records and billing information. The managing organisation puts them together and analyses it. If the organisation has other similar facilities and contracts, they are of a great help in the benchmarking. (Siltala 2003, pp. 50-51.)

The information gathered and compared is valuable in the future tenderings. The process of contracting out is a process of continuous learning and accomplishments, and the mistakes made prove to be of great help in the next process. Especially the improvement and specifying of the technical part of the contracting is important. (Siltala 2003, pp- 51-52.)

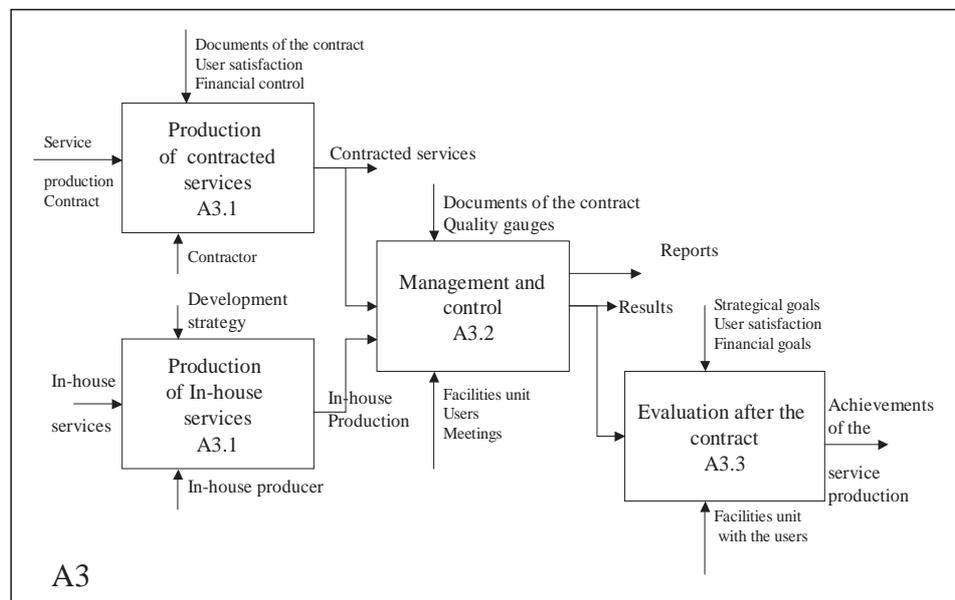


Figure 10. Description of the diagram A3 (Siltala 2003, p. 48)

## 8 Conclusions of the study

Contracting out in the municipal sector is a very complicated process and it needs tools to make the system more understandable for the parties involved. It is normal situation that there are a number of people working in several phases of this process, and the most important thing in the way to successful contracting is that the different crews and teams understand each other and do the things according to the same principles.

SADT is a good tool in several kind of process modelling. It is implemented first in the software engineering but it is also usable in different fields of other

sciences. Service production and contracting in Finnish municipalities is in many ways a similar process like the development of computer software or a tool to solve a problem.

The model in this article is divided in three main parts. The first one is the strategic part of the process, the second is the contracting procedure and planning of the service production, and the last one is the contract term or the production phase. These phases are also divided into sub-phases, which clarify the different duties that have to be done on the general level.

There are no practical experiments on using the SADT in process modelling of contracting in Finnish municipalities yet, but several municipalities have adopted the tool and hopefully the results achieved by the practitioners can be used in the future. It seems to be clear that the different viewpoint can open up possibilities for different levels of municipal decision-making and labour to get involved in the process.

It is also recommended that the municipalities should make their own SADT model of the own service production and adjust the tool to meet the requirements of the individual organisation. The model is not a tool just for the Finnish municipalities but for the foreign examples as well. For example the Nordic Countries have a local authority system quite similar to the one in Finland and the implementation of the SADT model to their needs would open a range of possibilities in co-operation.

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