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# Management system for Tuusula's infrastructure unit

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ABSTRACT

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Tuusula infrastructure unit is responsible for several infrastructure and the environment related assignments, which include for instance street planning and construction, support of zoning work, rehabilitation of degraded land, maintenance of streets, parks and other public areas, public transport and watershed restoration projects. However, the unit has not had any written guidance or process diagrams to perform these tasks. For this reason, quality assurance and monitoring of the work was challenging and the performance of tasks depended on to verbal guidance and acquired routines.
The purpose of this work was to create a management system for infrastructure unit which would contain internal guidelines and best practices, as well as describing the performance of tasks in process charts. The aim was also to clarify the interfaces between the other units and thus improve cooperation.
Process diagrams were drawn up QPR software and the source material for process charts were collected by interviewing the employees of the unit. In addition, to support the process diagrams, an explanation form was created, which described in more detail the responsibilities of the various workers at each stage of the process chart

As a result was the management system was completed as well as 13 different process description.

Key words: Management system, infrastructure, processes, QPR-software, unit

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NIEMI, SUVI: Toimintajärjestelmän laatiminen Tuusulan yhdyskuntatekniikan yksikölle

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Tuusulan yhdyskuntatekniikan tulosalue vastaa monesta infrastruktuuriin ja ympäristöön liittyvästä tehtävästä, joita ovat mm. katusuunnittelu ja rakentaminen, kaavoitustyön tukeminen, pilaantuneiden maa-alueiden kunnostaminen, katujen, puistojen ja muiden yleisten alueiden kunnossapito, joukkoliikenne sekä vesistökunnostushankkeet. Tulosalueella ei ole ollut kirjallista ohjeistusta tai prosessikaavioita näiden tehtävien suorittamiseen. Tästä johtuen laadunvarmistus ja töiden tarkkailu oli haastavaa, kun tehtävien suoritustapa on riippunut sanallisesta ohjeistuksesta ja opituista rutiineista.

Tämän työn tarkoituksena oli luoda yhdyskuntatekniikan tulosalueelle toimintajärjestelmä, johon kirjattaisiin ylös tulosalueen sisäinen ohjeistus ja parhaat käytännöt sekä kuvattaisiin tehtävien suorittaminen prosessikaavioin. Tavoitteena oli myös selkeyttää rajapintoja muiden tulosalueiden välillä ja näin parantaa yhteistyötä.

Prosessikaaviot laadittiin QPR-ohjelmistolla ja lähtöaineisto prosessikaavioihin kerättiin haastattelemalla tulosalueen työntekijöitä. Lisäksi prosessikaavioiden tueksi laadittiin oma selitekaavakkeensa, johon kuvattiin tarkemmin eri työntekijöiden vastuut kussakin prosessivaiheessa.

Lopputuloksena syntyi toimintajärjestelmä sekä 13 eri prosessikuvausta sekä selitekaavaketta.

Asiasanat: Toimintajärjestelmä, kunnallistekniikka, prosessit, QPR-ohjelmisto, tulosalue

# Contents

# 1. INTRODUCTION

## 1.1 Background, the starting situation

Tuusula is a municipality of 36 000 residents in Central Uusimaa, Tuusula's location is shown in figure 1. As a municipality it is very countryside based and spread over a large area – Tuusula's total area is 225,46 km². In addition, Tuusula has three different population centers: Hyrylä, Jokela and Kellokoski (figure 1). The amount of maintenanced streets and pedestrian & bicycle paths is 354 km (Tuusula 2011).

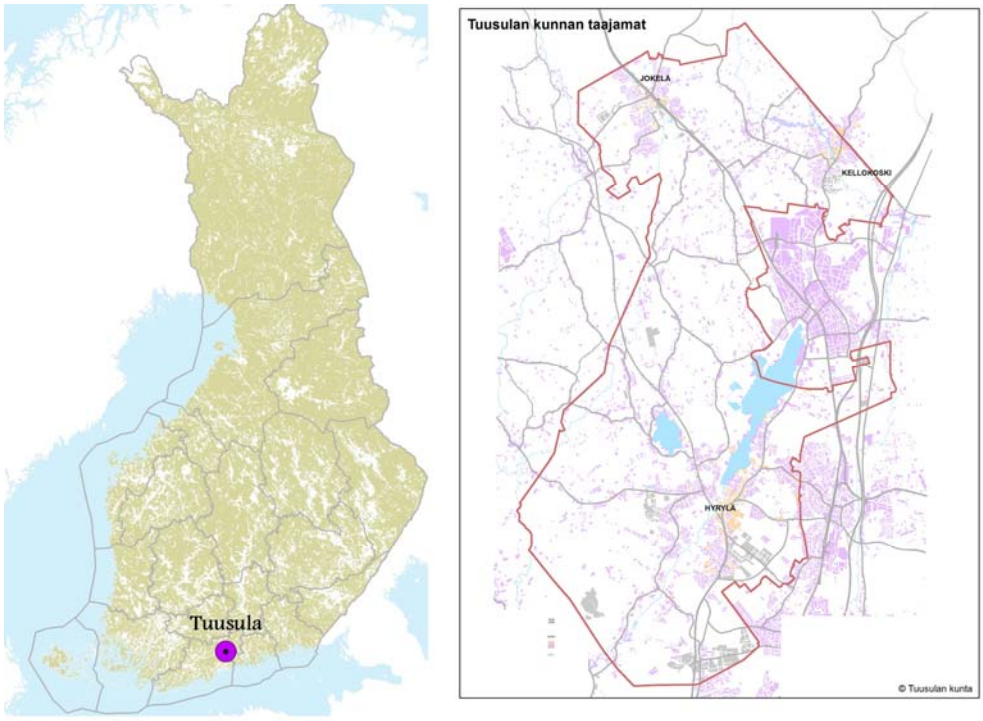


FIGURE 1 Tuusula's location in Finland and map of Tuusula's municipal structure (MML CC 4.0 2016)

The infrastructure unit employs 45 employees and is part of Tuusula's Municipal Development and Engineering division. The main operation of the unit is producing street and water supply plans, those including construction of new residential areas and renovations plans of existing streets. In addition, the unit is also responsible for the following operations: excavation and placement permissions for cables and other underground structures, street maintenance, renovation of

contaminated land areas, traffic-related studies and plans, water supply plans for sparsely populated areas and the production of several theme maps. These operations consist of approximately 60 different tasks - of which 15-20 have wide-ranging impact on other units operations, for instance on area planning, building control, and waterworks.

The infrastructure unit did not currently have any written instructions about working practices or routines. There is only rough estimation of total number of different work tasks, but only a few of them have been illustrated by process diagrams or researched how they influence each other. Therefore the overall picture is missing and manner of implementation of these tasks is likely to vary by the person carrying it out. In conclusion, the need for management system has been recognized. But what is management system, and how does it suit to the municipal environment? Moreover, how is the management system formed, what kind of working methods are needed?

## 1.2 Ideal situation

In an ideal situation all processes would be mapped and registered in management system. The purpose and use of the management system would be clear to all employees, and also that they would have the feeling that the management system supports and eases their everyday work.

The aim is to use universal process modelling symbols and the swim lane technique, like in the figure 2. In process modelling, there is large scale of different symbols that can be used. Symbols used in this work are shown in figure 3. In the management system process charts should be definite and easy to understand, and furthermore all processes would have clear starting and ending points like in the figure 2.

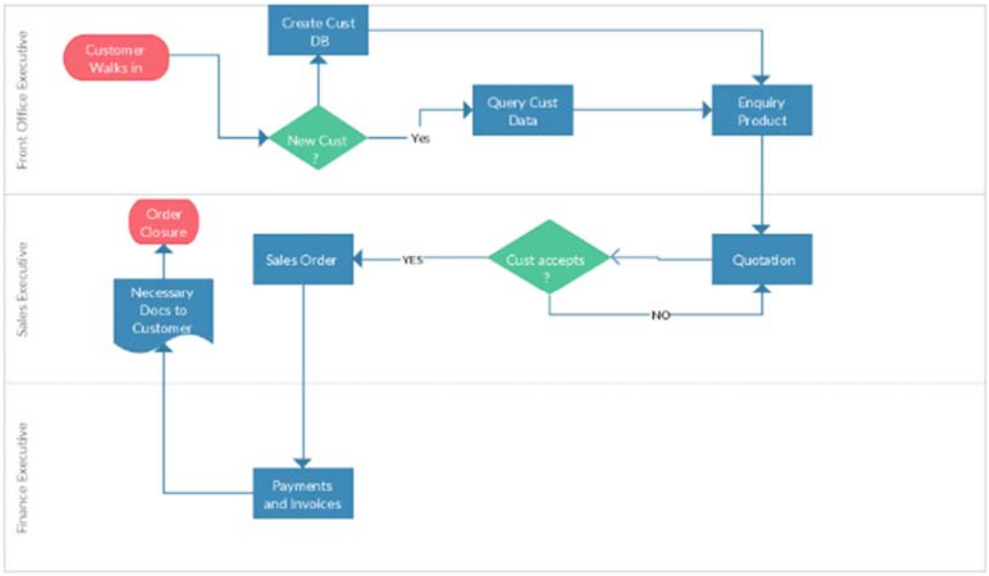


FIGURE 2 Example of clear process chart (Valluvan 2015)

In the swim lane technique the chart is divided into lanes where each lane represent an employee or cooperation partner. In this method all process steps must be appointed to at least one of the participants. This way it will be clear who starts the process, who is involved in each step and what the result or product of the process is. (Mindtools 2016)

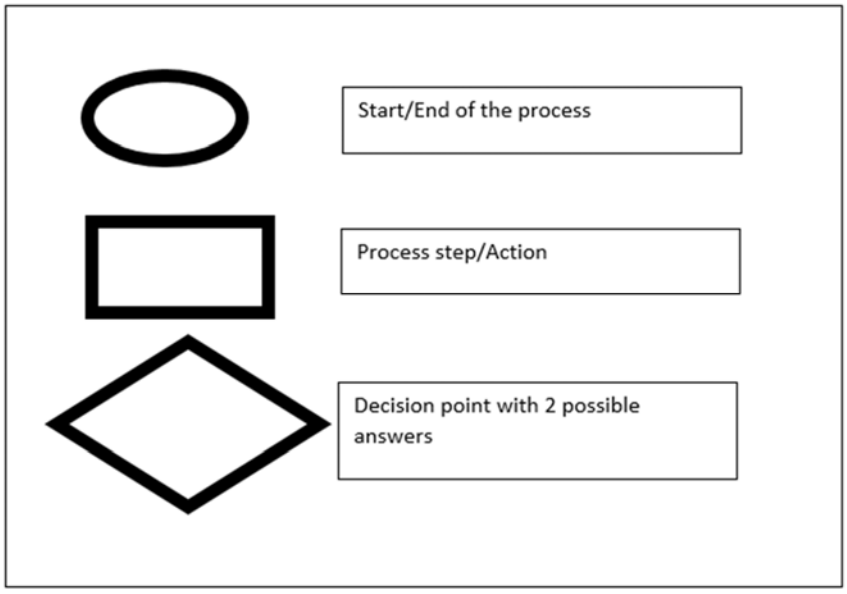


FIGURE 3 Process modelling symbols (MindTools 2016)

## 1.3 Research strategy and methods

The first step in this project was data collection. The information for process diagrams and process overviews will be collected by interviewing all employees about their working practices and routines.

After data collection a project group will be formed to evaluate features of the upcoming management system. The project group will be assembled mainly from Tuusula's Infrastructure unit. Project group's main task is to negotiate the new working practices.

Next step is producing process diagrams and descriptions. Process illustrations will be based on JHS recommendations. However, the design and amount of description levels is still under consideration. According to JHS, processes can be presented at most on four levels, nonetheless by combining different levels, it is possible to illustrate processes with just one level. (JHS-The Advisory Committee on Information Management in Public Administration 2002)

When the current situation of working practices and processes is ready, the results will be introduced to the project group. At this point there will be preliminary conversation about necessary changes and weak spots of current situation.

In the background, there was constant writing of the management system, which included lot of data collection and interviews. The thesis timeline is roughly presented in figure 4.


FIGURE 4 The timeline of the thesis work

## 1.4 Research questions and the aim of the study

Aims of the study are to:

1. Create a management system for Tuusula's infrastructure planning unit
2. Discover best policies and working practices to work with
3. Clarify the interfaces of responsibilities and task between different units

## 1.5 Acknowledgements

I want to thank all my colleagues in Tuusula municipality for their support and cooperation in this thesis works, especially Petri Juhola, who provided me this interesting thesis idea.

I would like to thank also Eeva Aarrevaara and Paul Carroll for feedback and guidance during the writing process.

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# 2. TUUSULA'S INFRASTRUCTURE UNIT

## 2.1 Organization and recent changes

Tuusula's infrastructure planning unit was until 2015 part of municipality's Technical services but after year 2016 organization change, it came a part of division called "Municipal development and engineering" (figure 5). In the earlier organization operations like zoning, land use and infrastructure belong to their own division, but after the change, they became units under the new division.


FIGURE 5 New organization chart of Tuusula's municipal development and engineering

This thesis work was started before the organization change, for that reason the management system is mainly emphasized on those operations, which belong to the old infrastructure planning unit. After the change the infrastructure unit got two new units under its supervision, which are: maintenance and green areas, and public transport. Processes of these two units have been excluded from this thesis work, and they will be supplemented to the management system later.

## 2.2 Decisions in infrastructure unit

### 2.2.1 Infrastructure plans

The infrastructure planning unit’s main product are the infrastructure plans, for instance streets, parks, parking areas etc. The decision about choosing planning subjects and approving of plans for display are made by head of infrastructure.

The passage of infrastructure planning is illustrated in figure 6. Before construction, all plans must be set for on display for 14 days. As an exception to this rule are the water supply line plans. If the plan only consist of water supply lines, no display or Technical board approval is needed. However, the landowners and residents must be informed about the future construction work in their neighborhood.

The landowners and residents in the planning area are separately informed by letter about the display. Also an official announcement of display is published in local newspapers and municipalitys website.

During those 14 days landowners and residents may leave appeal about the plan. After that, the infrastructure planner composes a response to the appeal or appeals. Then the municipalitys Technical Board decides whether the protest is justified and whether the plan is approved or returned back to planning phase. If the plan is approved, starts the appeal period, which is 37 days. If no appeal is left in that time, the plan becomes legal and the construction work can be started.

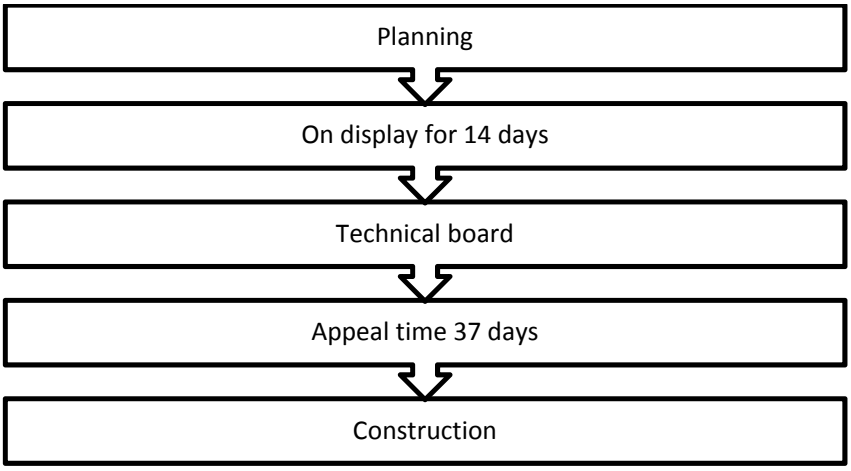


FIGURE 6 Process of infrastructure plans

### 2.2.2 Permits

Permits issued by the unit are granted electronically via the Lupapiste-service, where permits are treated by that official, to whom the decision in question belongs.

### 2.2.3 Head of Infrastructure, decisions and responsibilities

Head of infrastructure is responsible for the infrastructure unit and the infrastructure planning unit. Head of infrastructure leads the activity of the unit and unit and ensures that annual targets are achieved. Head of infrastructure also decides on matters belonging to the unit within the approved budget (annual budget), instructions and orders (administrative rules):

- Placement permits (wires, equipment and structures), after introduction of Lupapiste-service these decision have been delegated to infrastructure planners
- Displays infrastructure plans for approval by the Technical Board
- Consent of buildings and constructions minimum distance requirements to deviate from municipal streets, parks and other common areas
- Water supply lines work permits
- Infrastructure planning contracts up to a certain allocation

- Infrastructure construction contract decisions up to a certain allocation, these contracts can also be made by several other officials, which all have different allocation available

### 2.2.4 Technical Board, decisions and responsibilities

Technical Board is the supreme decision-making body supervising Infrastructure and Municipal facilities units. Technical Board decisions and responsibilities are defined in the administrative regulations of technical board. According to it, Technical Board is responsible among other things the following matters:

- The planning, development and construction of municipal infrastructure planning (streets, parks and other public areas)
- Municipality's forest property management
- Remediation of contaminated land areas, if the responsibility belongs to the municipality
- Organization of public transport
- Statements to the plans within division or affecting the division
- Statements of plans which include infrastructure or some other matter associated with the Technical board

Technical Board makes decisions within the framework of their appropriations among other things the following issues (if the decision turned on the appropriations panel border, matter is controlled either by the municipal government and, if necessary, to the Board of Governors for approval):

- Divisions purchases and contracts and plans concerning the division, within the limits council, unless otherwise stated in the municipal government or in the other municipal regulations otherwise specified
- Distribution of aid appropriations
- Maintenance of streets or their termination
- Changing a road as a street (This is an administrative change. The roads are maintenaned by government and streets by the municipality)
- Transferring decision power to the officials

# 3. MANAGEMENT SYSTEMS

## 3.1 Management system in general

The ISO definition for management system is “A management system describes the set of procedures an organization needs to follow in order to meet its objectives“. In other words, the management system is manual of the organizations operations and at its best it can be used as an orientation material to new employees. Usually management systems are audited by external company in order to guarantee an impartial quality control. In this work, there will be no audits, the main objective is to create preliminary base for quality control for one unit of the organization. For this reason, the structure of the management system will not completely follow the official version on management systems. (International Organization for Standardization (ISO) 2016)

In a management system is a large entity consisting of many different parts. The main idea is to review organizations operations from 3 different perspectives: quality, safety and environment. (Moisio & Tuominen 2008, 8).


FIGURE 7 Structure of management system (Quality Knowhow Karjalainen Oy 2016)

In this work the aim was to create a general description of the unit's activities, work instructions and process descriptions. The aim is also to examine at the same time the operation's relations to legislation (laws, acts and articles) and other units operations.

The management system should be based on the structure illustrated in figure 7. From that structure, the most essential parts are:

- Description of organizations operations
- Process descriptions and illustrations
- Work instructions
- List of laws, acts related to operations

Management systems are based on international ISO standards, of which ISO 9001 (Quality management systems) forms the base for all other standards. The ISO 9001 aims mainly at improving efficacy and increasing customer satisfaction. The main idea is to control and improve the relationships between different processes, basing on usage of PDCA-cycle (Plan-Do-Check-Act) and risk-based thinking. The standard requires systematic defining of process, using the PDCA-cycle described in the figure 8. PDCA is based on planning and checking the plan before implementation, in order to recognize possible errors before using the methods in larger scale. (International Organization for Standardization 2016)

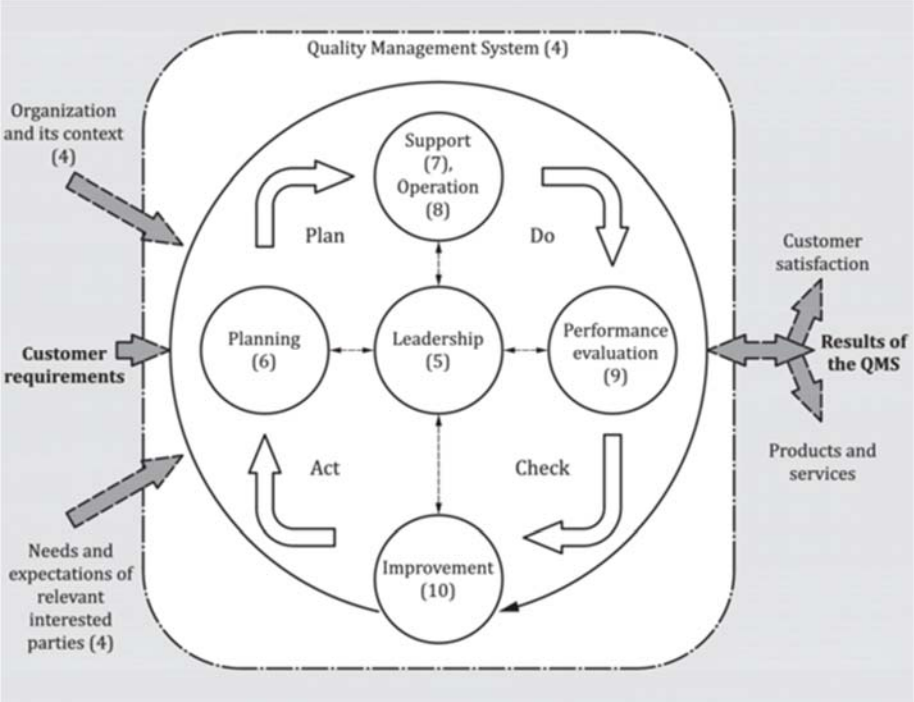


FIGURE 8 PDCA-cycle (International Organization for Standardization (ISO) 2015)

The aim of a management system is to act as an administration tool and aid system. By describing working practices and policies in written form, the probability of misunderstandings and bottlenecks of operations is reduced. In many cases problems appear on those occasions when the responsibility of the tasks is transferred from one unit to another. If the process is not clear to everyone involved, the implementation of task may delay or even fail. Therefore in a management system it is important to clarify the interfaces of responsibilities and tasks between different units. In the process of constructing an operational system, current routines and policies must be evaluated and if needed settle improved versions of them.

In another words the target of developing operation system is to save time and resources, minimize the risk of errors, unify working practices between different units and intensify transfer of knowledge between them.

### 3.2 Lean or not?

Management system are often linked to some process improvement programs like Lean, Kaizen or Six-Sigma. Most of the programs share many common features, for example the concept of using measurement and statistic as an improvement tool. And naturally some newer programs can be just improved editions of the existing programs. According to Mark Gershon, the combination of Lean and Six Sigma seems to give best results at the moment. Apparently this combination provides more tools for improvement and achieves results faster. Actually, this merge of Lean and Six Sigma programs is referred to be a method of the future. *(*Gershon 2016, 68.)

Lean principles were originally developed for Toyotas auto industry to intensify their processes. One of the main principles of Lean is to reduce and trim those process steps which do not increase the value of the product. When the effects of Toyotas Lean principles started to make a profit, other companies and the industry began to apply the principles of Lean manufacturing. Today organizations around the world, not just industry, are promoting Lean concepts and the Lean principles are introduced in many publications and included in education and research. (Lean Enterprise Institute, Inc 2017)

How does improvement programs adapt to municipal environment? Lean is said to for example increase efficiency, improve quality and reduces cost. However, there can be some negative impact to team unity and team morale, partly because the results of the program are rarely immediately visible. (Rohner 2016)

For example management in the city of Irving in the USA have successfully followed Lean program to develop their operations. As a result of the program they got, for instance, a significant reductions in project work and permitting cycle, they also got their operations standardized and streamlined their information flow. These results resemble quite much the goals of this management system work. (Gonzalez 2011)

Also in the case of the city of Grand Rapids utilizing Lean principles helped to reduced waiting time and removed useless process parts. However, in this case it is also noted, that changes cannot happen without authorization and commitment

from executive-level. In this work, the aim is to start developing one part of the organization, the infrastructure unit. There are plans in Tuusula for municipality wide process modelling and developing, but the actual timetable is not confirmed. But even though, this management system will not be made by Lean principles, some of the developing methods of the program might be utilized in process development. (Drickhamer 2008)

# 4. PROCESS MODELLING

A process is a set of steps and decisions, which are involved in order to get work completed. A process can be as simple as doing your groceries to more complicated process like building a new street. According to Baird process consists of 4 elements:

- Steps and decisions — in other words the process chart describing the passage of the process
- The process variability – the effect of processing times
- The connections between process steps and the effect of timing
- The usage of resources (Baird 2014)

In the process modelling, processes are divided to 3 main categories, presented in a process map in figure 9. A process map is an overall description of the organization processes and their inter-connections. In the process map, the core processes are the most important to the operations of organizations and are most visible to the customers. In addition to the core process, the organization have other main processes and support processes closely linked to other processes. The idea of a process map is to describe these links between different processes. For example in the Tuusula's infrastructure planning unit's the core processes are the planning and construction infrastructure. The core processes usually have many support processes, for example plan filing, assembling of starting material and display of plans. Also the processes are controlled by customer needs, organizations strategy, values and vision. Above all is the legislation controlling particular operations, for example the Land Use and the Building Act. As a result of all processes is the output or product given to the customer. In addition to that it is essential to monitor the realization of the process, to assure functionality of the selected practices. (JUHTA-julkisen hallinnon tietotohallinon neuvottelukunta 2012)

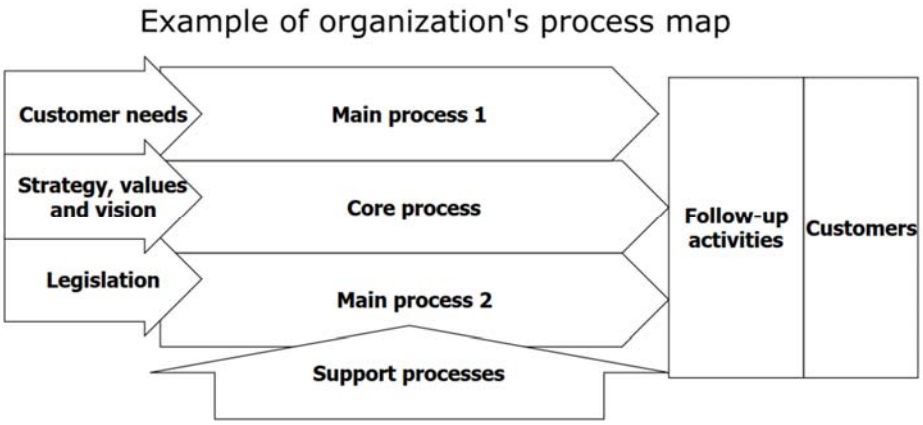


FIGURE 9 Example of Organization's process map (JHS-The Advisory Committee on Information Management in Public Administration 2002)

## 4.1 Defining processes

The process modelling is started by recognizing processes and defining process owners. The purpose of owners is to develop, improve and maintain the process with other parties involved in the process.

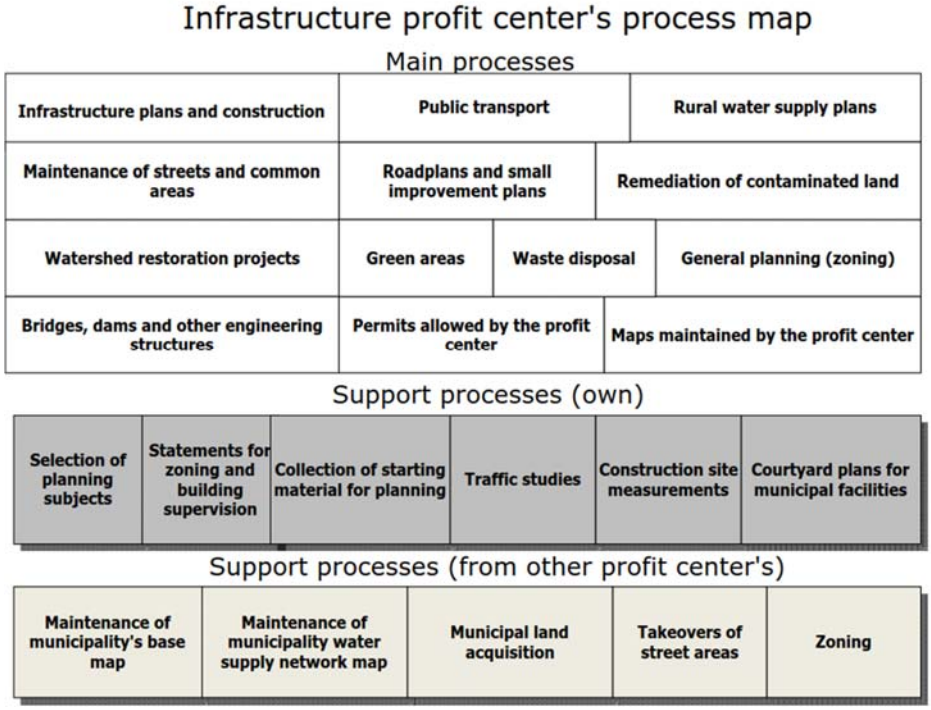


FIGURE 10 Infrastructure units process map

The processes of the infrastructure unit in Tuusula are shown in figure 10. Based on group work 13 processes were identified as main processes. In addition 6 support processes and 5 support processes from other units were identified. Based on the process map in figure 10, following 16 processes were selected to process modelling:

1. Infrastructure planning and construction
    1.1. Infrastructure plans
    1.2. Infrastructure construction carried out by contractor
    1.3. Infrastructure construction carried out by infrastructure units own personnel
    1.4. Construction site measurements when the site is carried out by contractor
    1.5. Construction site measurements when the site is carried out by infrastructure units own personnel
2. Statements for zoning and building supervision
3. Road plans, when the municipality part of planning process
4. Small improvement plans for roads, when the municipality part of planning process
5. General planning (support of zoning work)
6. Rural water supply plans
7. Permit allowed by the profit c
8. Remediation of contaminated land areas, if the responsibility belongs to the municipality
9. Maps maintained by the unit
    9.1. Traffic sign map
    9.2. Street lightning map
10. Collection of starting material for planning
11. Courtyard plans for public buildings

Two of the main processes were identified as core processes of the unit, these processes were infrastructure plans and infrastructure construction. From residents' perspective, these processes are most visible, easy to evaluate and observe. Street construction sites are usually quickly noted by nearby residents and the passage of the process is observed on a daily basis. While for example street lightning map maintenance inside the unit is not usually witnessed by others than unit employees.

## 4.2 Process charts

When the processes have been defined, the next step is to create process charts describing the passage of processes. For this purpose a program called QPR EnterpriseArchitect was used. This program was chosen mainly because it was the only program the municipality had already purchased for this purpose. In appendix 2 is shown one example of a final process chart.

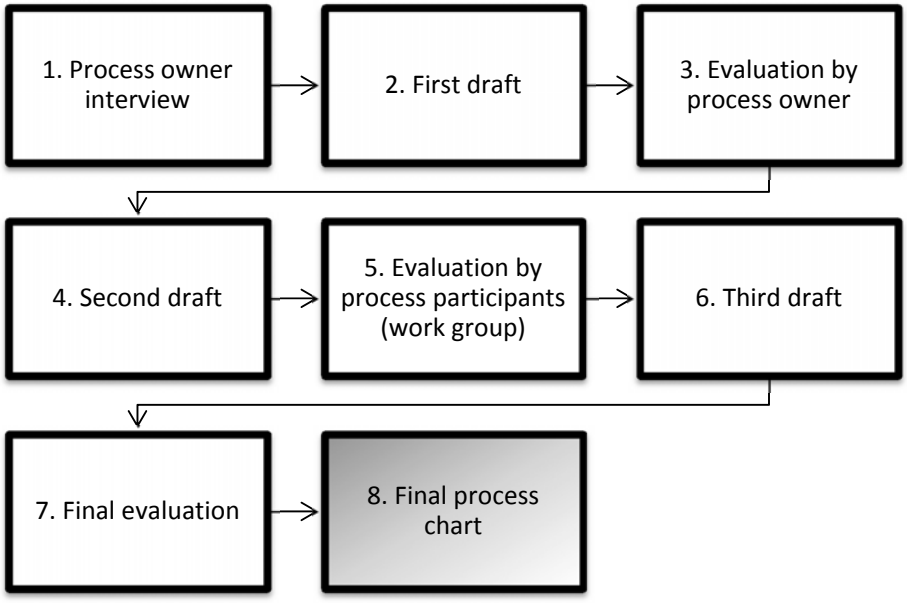


FIGURE 11 Method used in process chart drawing

The creation of process charts followed the 8 step method described in figure 11. The first step was to interview identified process owners. The process owners were identified by evaluating who has the main responsibility in the process in the question. In the second step, on the basis of the interviews, the first draft of process chart was drawn. The first draft was then evaluated by the process owner (third step). In the fourth step was the second draft of the chart drawn. Then the draft was developed by the process owner's comments on the second draft. The second draft was then evaluated together with all process participants. On the basis of the discussion, the third draft of the process chart was drawn. The draft was then send for final comments, and if it was unanimously approved, the draft was marked to be the final version. If the draft was not approved, another version of it was drafted, based on the feedback.

### 4.3 Explanation form

In addition to process charts, a management system also requires explanation forms explaining and supporting the process charts. Even if the process chart is made as clear as possible, the boxes describing process steps, can only include a few words, which is not enough to explain all details of that process phase. For this reason, the explanation forms are developed. For example JHS has developed its own model of it, the functions table and the basic information form. However, forms have their own deficiencies. The forms contain lot of jargon associated with process modelling and some of the information required in the forms is not beneficial to this work. During the interviews, it was also concluded, that forms were hard to interpret. For this reason a new form was developed, on the basis of those two forms. The goal was to make a simple form, easy for all employees to understand. Also, on the basis of interviews, it was concluded that it is essential to minimize the amount of different forms and documents. This way in the final result there will be only two documents: the process chart and the explanation form. The explanation form is the appendix 1. (JUHTA-julkisen hallinnon tietotohallinon neuvottelukunta 2012)

The new explanation form contains the following information:

- A short description of the process
- A list of the employees involved in the process (within and outside of organization)
- The support processes linked to the process
- The process owner
- Documents linked to the process and documents formed as a result of the process
- Location of documents linked to the process
- Legislation and guides linked to the process
- Environmental issues linked to the process
- Safety issues to be considered during the process

In addition to this info, there is table describing the tasks and responsibilities of each person in every step described in the process chart, an example of the table can be seen in appendix 1.

The process explanation forms were filled in along with the process chart creation, but most of the information was gathered during the interviews.

### 4.4 Interviews

The information in the explanation forms was gathered by interviews of process owners. In the interview the process step were checked over and written in the explanation form. For each process there were about 2-3 interviews carried out. The first interview was started by defining process participants. Then the process phases were defined and each employee's tasks and responsibilities were defined to each phase. In the other interviews the process owner checked the made changes and evaluated their accuracy.

### 4.5 Work groups

After the interview, the process was looked through in work groups. In this work groups where invited all participants involved in the particular process. The comments and development ideas where written down and the chart and form where updated. The idea of work groups was to create general discussion of the process in hand and dissolve possible misunderstandings linked to the responsibilities. For example, in some cases, the process owner was not completely aware what the next steps in the process are after his/her part in it.

After the work group sessions, the material was updated based on the comments and then send for comments to all participants. If the material was unanimously approved, the process modelling was finished. If not, at the work group would meet again to discuss the matter. And finally, when all process modelling material was finished – it was given to the unit executive for final evaluation. In this evaluation the unit executive could either approve the material or return it back for editing.

# 5. RESULTS AND EVALUATION

As a result an infrastructure units management system was created and as its attachments process map (figure 10) and 16 different process descriptions were produced. From these processes 11 were main processes and the other 4 support processes. In addition to units own processes, 5 support processes provided by other units were detected. However, these support processes by other units were described only from those parts, which are linked to the described processes.

## 5.1 Infrastructure units management system

The management systems structure was based on the pyramid in figure 7, which is described in more detail in figure 12.

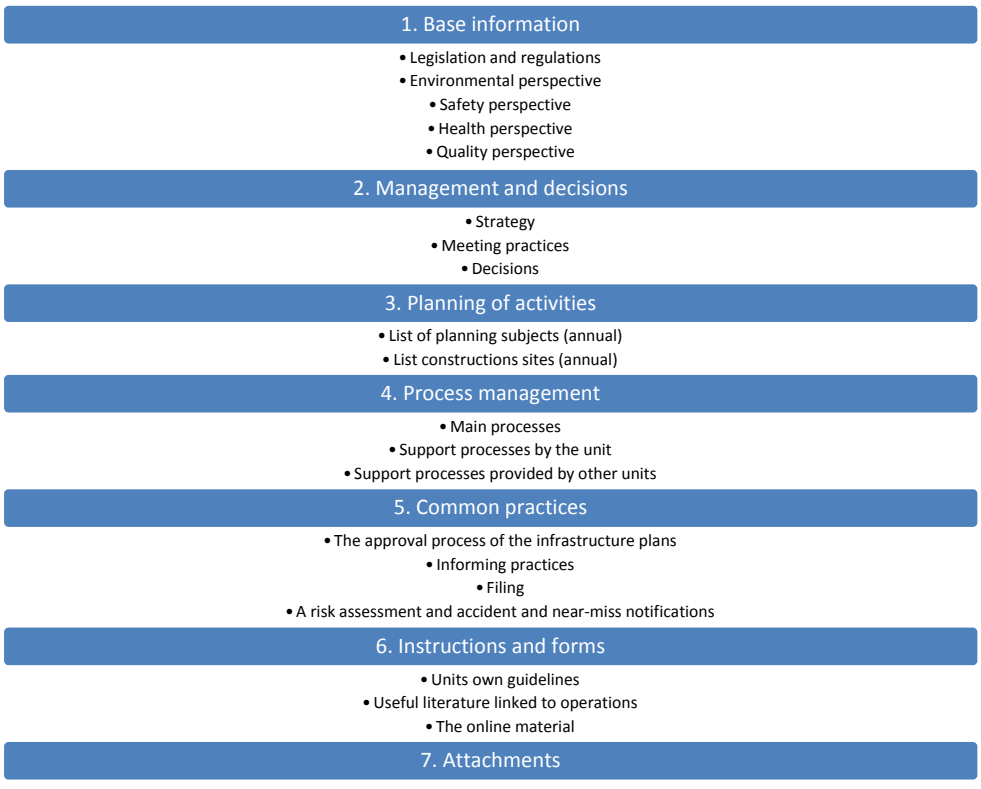


FIGURE 12 The structure of infrastructure unit's management system

The management system was written gradually and the information was gathered through interviews. During the writing process, the management system was intermittently given for inspections to the employees. This way, factual errors and misunderstandings could be detected as early as possible. Because of the main goals was to use the management system as an orientation document, the inspection were mostly made by the newest employees. This way, it could be tested whether the document was fit for its purpose. Nonetheless, it was also important to give the document for inspection to the older employees, who have gathered a great amount of so called “quiet information” about the operations and practices.

The first section of the management system contains the base information linked to units operations, which is the legislation regulating units operations and also the quality, health, safety and environmental perspectives which must be considered. The legislation paragraph includes a list of the laws and regulations, and a short description about their effect on units operations. In the quality paragraph it is explained how units work and the quality of outputs is being measure and maintained, for example how resident satisfaction surveys are taken into account in units operations. The health and environmental paragraphs include only reference to the municipality’s general health and environmental guidelines, because these instructions are the same for all municipal employees. The safety paragraph includes the guidelines that are characterized for the unit, for example which safety courses must be completed and by whom. For instance, employees at the construction site need different kind of qualifications than the office workers.

The second section contains description of unit’s management, the role of head of infrastructure and Technical Board. The effect of the municipal strategy to the unit level is shortly described. Also content, purpose and repetition of different meetings is defined.

The third section consists of narration about units planning of its activities, for instance how units annual operations are planned, carried out and monitored. For example, the infrastructure planning unit has its own list of annual planning subjects, which is regularly updated.

The fourth section contains a description about process management in the unit. The processes and their special features are explained in more detail from those parts that cannot be explained in the process chart or explanation form.

In the fifth section units common practices, are explained for instance related to risk assessment, infrastructure plans approval process and informing practices. These operations are part of larger processes, but because of their level of detail, it was seen necessary to explain them more closely in this chapter.

The sixth section contains a list of units own instructions, useful literature linked to units operation and online material. For example, related to infrastructure planning many publications from InfraRYL (General quality requirements for infrastructure construction), which defines most of the quality requirements in infrastructure planning and construction were listed.

At the end of the management system is a list of attachments, for example the infrastructure planning operation guide, which is always sent to the infrastructure planning consults.

## 5.2 Case example, Permits permitted by Infrastructure unit

The process chart of the permits granted by the infrastructure unit is described in appendix 1. The infrastructure unit is responsible for all permits linked to public areas (streets, parks etc.), especially for organizing events in those areas or evaluating placements of pipelines or other structures (buildings permissions are not included in this process). All permits are managed online in “Lupapiste”-service. In the process chart, there are 5 different permits processes:

1. the placement permits (cables, pipes, wires)
2. placement of transformer substations
3. connection information (infrastructure)
4. excavation permit
5. the use of public land and permission to advertise

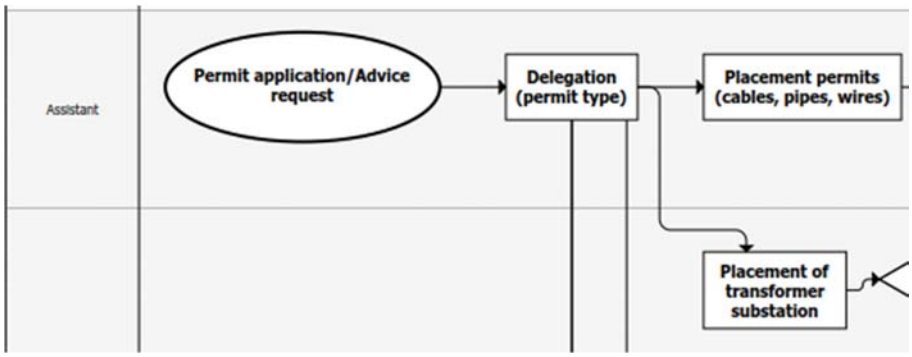


FIGURE 13 Process start point, delegation to the right official

The process starts with a permit application or advice request from an applicant (figure 13). First, the assistant delegates the issue to the right official for further investigation. If the issue is concerning placement of cables, pipes or wires, the assistant manages it herself/himself.

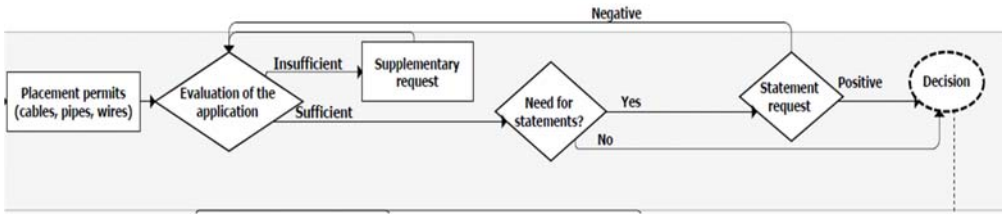


FIGURE 14 The process of placement permits (cables, pipes, wires)

In the placement permits (figure 14) the assistant evaluates the application, if there is a detail missing, for example contact information, the assistant demands the applicant to supplement the application. When the application is found to be sufficient, the assistant evaluates the need for a statement from other units. Based on given statements the applicant is required to change or supplement the application. Finally, when the application is stated to be finished, the assistant composes a decision of the placement. If needed, this permit can also be managed by the infrastructure planner.

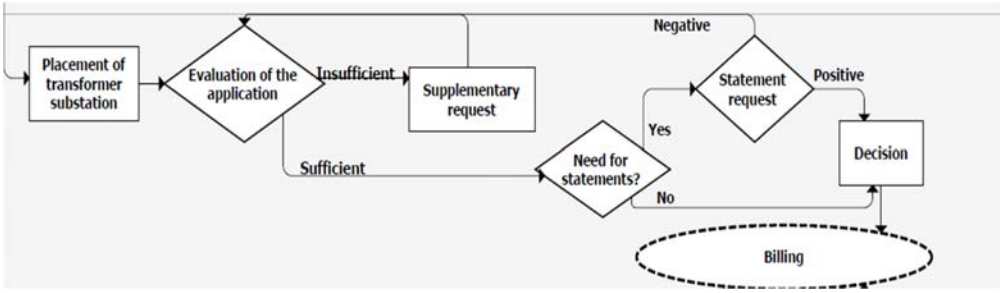


FIGURE 15 The process of placement permits for transformer substations

The process of placement of transformer substations (figure 15) is quite identical to the wires, pipes and cables placement process, with the exception, that the application processor is infrastructure planner. Also, because the permit is not free of charge, the last step of the process is charging.

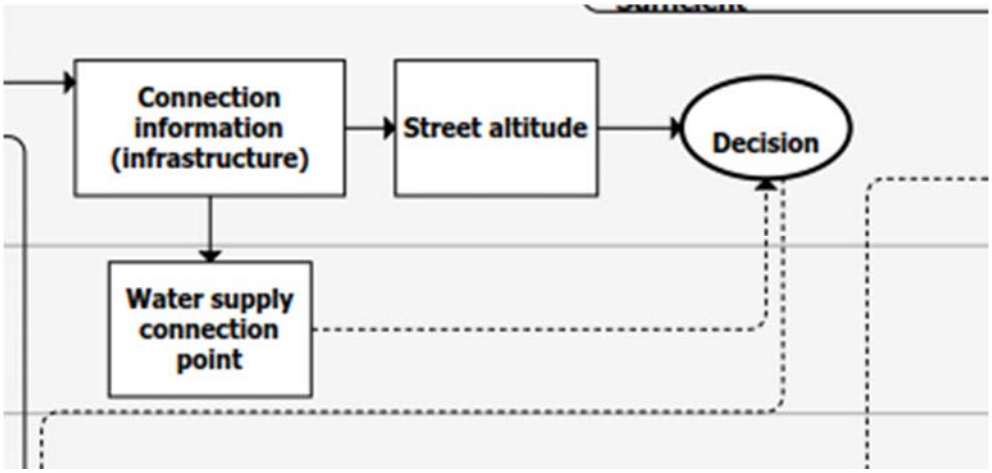


FIGURE 16 The process of connection information (to infrastructure)

The next process is called connection information (figure 16), which is the document required in building permits as an output data. The matter is first delegated from the assistant to the infrastructure planner (figure 13). Then the infrastructure planner defines the street altitude and request statement from the water supply engineer. The water supply engineer creates a map of the connection point to the waterworks and adds it in to the application. Then the planner gathers all the information into the decision.

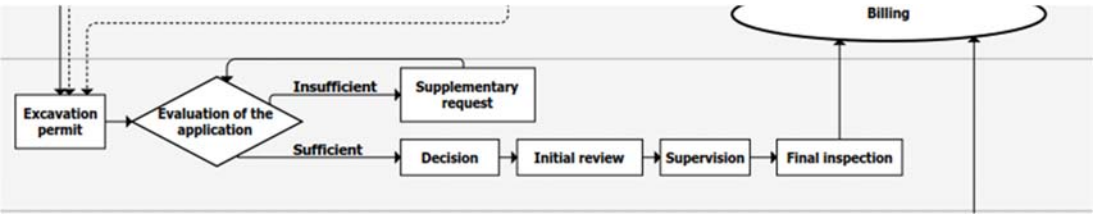


FIGURE 17 The process of excavation permits

Excavation permits are delegated to the road inspector, the process is shown in figure 17. The road inspector evaluates the application, and if needed, demands supplements. Then, when the application is stated to be sufficient, the road inspector makes a decision. After that is an initial review, where the inspector and applicant check together the starting status of the excavation site. Then the inspector supervises the excavation site randomly during the excavation. Finally, when the applicant announces that the exaction is finished a final inspection meeting is arranged. In the final inspection the road inspector either accepts the status of the excavation site or demands more finishing work to ensure that the site is returned to the same state as before the excavation.

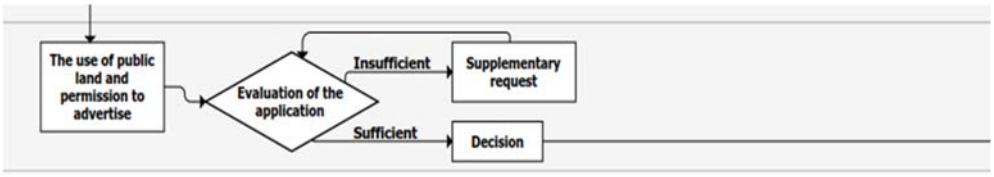


FIGURE 18 The process for permissions to use of public land and permission to advertisement

The last process is the use of public land and permission advertisement (figure 18). The purpose is to control the use of public land and ensure that no advertisement is located at a point where it can cause harm to traffic or to other party. These permits are processed by maintenance manager. The maintenance manager evaluates the application, and if needed, requires supplements. Then the manager either accepts or rejects the application.

From this processes only 3 of the permits are charged from the applicant, other permission is free. The charged permits are placement of transformer substation, excavation permit and the use of public land and permission to advertise. The

charging is managed by the financial secretary and the charging is the last step of those processes.

## 5.3 Problem solving group work

### 5.3.1 Methods of the group work

The problem solving work group work was mainly based on the use of an affinity diagram (figure 19).

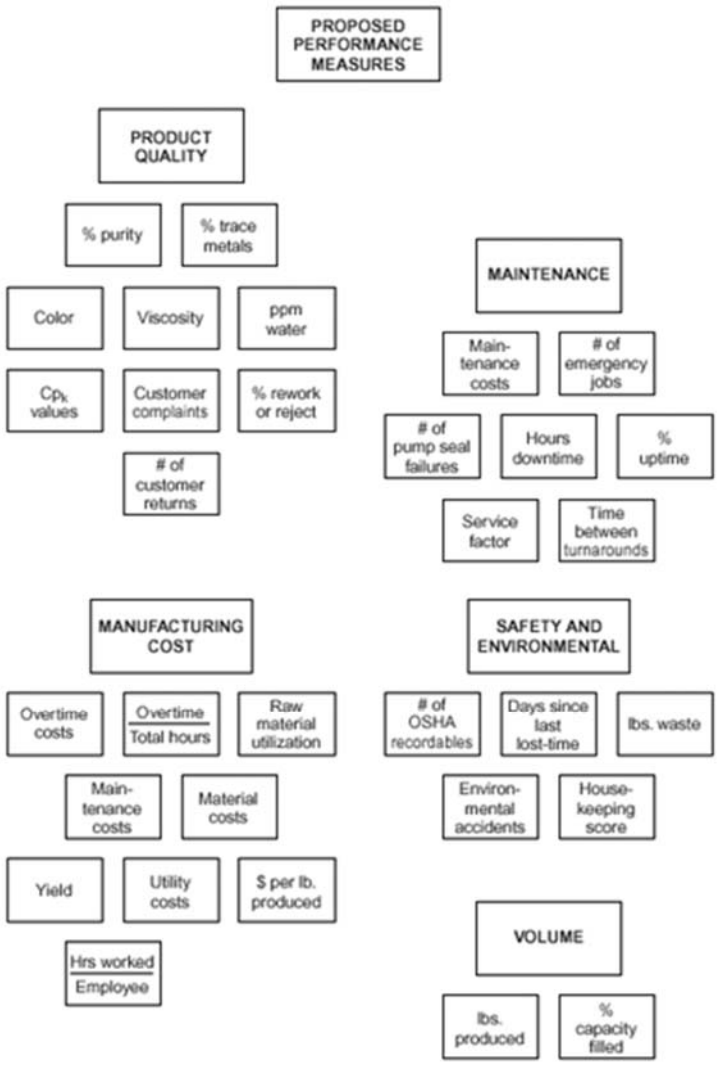


FIGURE 19 Example of Affinity Diagram (ASQ 2016)

The goal of the affinity diagram tool is to collect data related to the problem, this is usually accomplished through brainstorming session group work. The problem in hand is summarized in one question. The question can be defined by the group leader or in consensus of the group. When the question is defined, the brainstorming starts – in other words the group members write down answers to the question on sticky notes or cards. In this phase it is essential that no one talks. When the brainstorming is finished the notes will be gathered together, in silence, for example attached on a wall. Now the group member should organize related notes in groups. The group members can move each other's notes also, the grouping can continue as long as needed, but still in silence. When the note grouping is finished, the group members are allowed to talk and discuss the result. If necessary, changes to notes and their order can be made if seen necessary. Finally, the group should give each group an appropriate title, like in figure 19, where notes are gathered under 5 different titles (Vorne 2016).

### 5.3.2 Results of problem solving group work

Most of the problems were identified in process description work groups, where process maps where under discussion. In addition to that, it was seen necessary to discover underlying problems some other way. For this purpose a separate work group session was organized, which only focus was the problem solving.

Before the work group (14 people) the participants were sent an anonymous survey through Surveypal-service inquiring about the identified problems participants wanted to be dealt in the work group (Surveypal Oy 2017). As a result 5 suggestions were received:

1. Is there a quality difference between plans ordered from consult and unit's self-produced plans? Does the quality depend on source? Are the plans clearer or less clear if they are made in the unit?
2. Is there a problem in the flow of information? Does the info about changes or need for changes in street plans travel fluently from office to the construction site? Is there development needed?
3. The structure and content of the plan folder is not consistent with the instructions. The documents are not always in right folders, which can lead

misunderstandings and use of wrong material, for example if construction site uses old version of street plan.

4. Fragmentation of electronic material. Is the information and the documents in the right place? What causes the problem?
5. Selection criteria of planning subjects. How planning subjects are selected and by whom? Is there development needed?
6. Quality control of plans. How to develop quality control? What are our current problems?

Based on general discussion in the problem solving work group, option numbers 5 and 6 were chosen for problem solving. Then 3 groups were formed and there were 4-5 persons in the group. Then the work group was executed in following order:

1. Brainstorming session – what is linked to the problem in hand?
2. Grouping ideas within the group
3. Finding titles for the groups
4. Brainstorming session – how to solve the problem
5. General discussion

In the general discussion part, the results of different groups were compared. The results were quite much alike, but there were some differences in group titles and emphasis of different matters. The results can be seen in the figures 20 and 21.

### 5.3.3 Result, quality control of plans

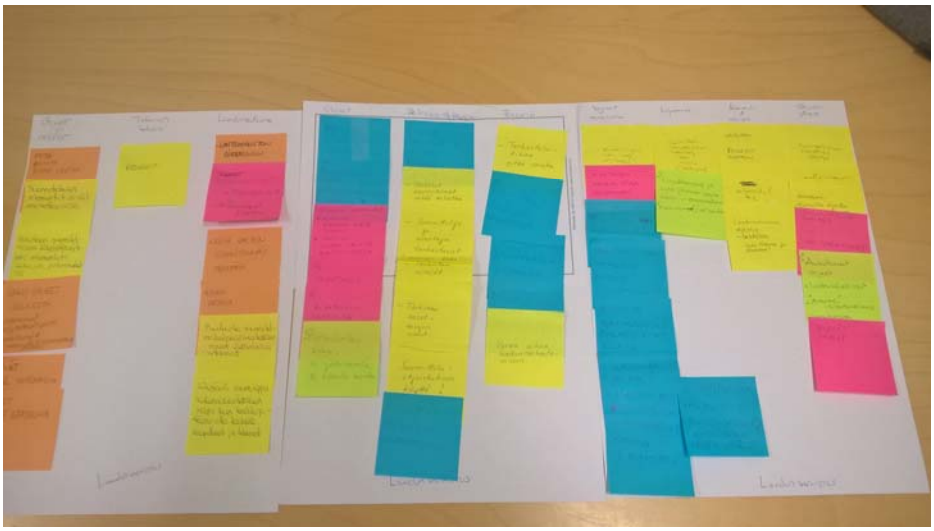

FIGURE 20 Quality control of plans, assembled result of the 3 groups

The result of the quality control of plans is shown in figure 20. Following problems were identified:

- Maintenance of instructions and updating of them is not done in regular basis. Also the instructions have their own loopholes
- Infrastructure plans expand during the planning, the objective of the plan changes too much during the planning process.
- There is not enough time for plan inspections. Because of this too many planning mistakes are noticed only at the construction site.
- The infrastructure plans do not comply with the instructions (both own and consultant). This linked to the problem of plan inspection time.
- Infrastructure planning projects are carried out differently if it is a "big" or "small / less important" project. In smaller projects some process steps are skipped to save time.
- The unit wide definition of responsibilities is missing. Responsibilities of all employees in infrastructure projects should be defined more clearly.
- The apparatus is not up to date (computers)

Solutions:

- Instructions must be updated in a regular basis. No loopholes should be left in the instructions.
- Objective of infrastructure plans must be defined early at the very beginning of the project.
- For plan inspection a checklist will be composed, the inspection time could be defined in the planning instructions.
- The responsibilities of employees will be defined in the management system and process descriptions.
- Everyone is responsible to announce any errors or shortcomings they notice in the planning documents.
- Projects must carried out on by the same principles regardless of the size or type of the project.
- Everyone must be prepared to adjust changes in plans. Procedures in different situations must be defined.

### 5.3.4 Results, selection criteria of planning subjects

The result of the selection criteria of planning subjects is shown in figure 21. Following problems were identified:

- Pressure related to the planning subjects. Lot of time is consumed answering initiatives, e-mails and phone calls by politicians and residents. Continuing contacts cause extra work and also cause the dilemma of impartiality. Some project can be started from initiative of one resident/politician. But for the residents it would be equitable to carry out those projects that will benefit larger group of residents.
- Infrastructure planning subjects are usually selected at the beginning of the year and subjects are set in implementation order. However, scheduling and forecasting have been found to be challenging. Sometimes urgent planning subjects appear unexpectedly within a year, which requires a re-prioritization of planning subjects. How to set urgent planning subjects in execution order and how to fairly prioritize projects?

- Prolongation of zoning projects. It is difficult to schedule infrastructure planning if zoning schedule is uncertain and there is possibility that the zoning plan may still change significantly
- The flow of information does not work, all employees are not up to date about the status of projects. How to develop the flow of information?
- Project coordination problems, how to reconcile projects form different units and unit, for instance municipal facilities construction or zoning.
- How to allocate sufficient resources? This is related to the problem of schedules

Solutions:

- Answers to the residents and politicians must be based on facts and not rushed because of the pressure. No quick implementation should be promised.
- Everyone must be prepared and ready to adapt to possible changes.
- The communication between units and units must be enhanced and more co-operation meetings must be organized.
- The focus should be in the long-term planning. Urgent needs must be paid attention to, but in the way that long term schedule is maintained.
- Each project must have up-to-date table, in easily accessible file, where the real-time information about the project is updated regularly.
- Annual budgets and schedules must be binding. If changes appear, there must be imminent announcement about the deviations.

FIGURE 21 Selection criteria of planning subjects assembled result of the 3 groups

# 6. DISCUSSION

The aim of this thesis was to create a management system and in the process, find best policies and working practices for Tuusula's infrastructure unit. In addition to the managements system 16 process chart were drafted to illustrate the passage of unit's processes.

During the thesis work the most time consuming part was process chart drafting. At first the processes in hand seemed simple and easy to follow, but as the drafting began, the processes proved to be more complex and versatile. Also, most of the employees were not accustomed to reading process charts and therefore understanding the charts took more time at beginning of the work.

However, when the processes were seen by the employees as charts, it was easier to detect the "extra" process steps, which did not add value to the process. The charts helped to make the responsibilities and tasks of each employee more concrete, which also made it easier to negotiate and assign tasks to right employees.

The management system required also a lot of work and discussion with the employees. When considering the management systems suitability to municipal environment, no contradiction or problems were identified. Whether the organization is private sector or municipal, the need of guidelines and instructions seems obvious and rises a question, whether it even should be set obligatory. If the organization is managed only by verbal guidelines, how can it be monitored or regulated?

The management system was seen useful by the employees, especially for the new employees coming from private sector. For them, it was essential to have induction material to municipal decisions, concepts and practices. Also, for older employees it was important to have written guidelines of the operations, because that way there was no longer room for interpretation, which saves time when all speculations and misunderstandings are avoided. Of course, even after the management system is finished, it is important that it will be updated in the future on a regular basis. Since, the usability of the management system will unravel only after it has been brought into real use.

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APPENDICES

Tuusula

APPENDIX 1

## Procedure guide
## Maintenance of streetlight map

| | |
|---|---|
| Description of the process | Maintenance of streetlight map. Adding new lamps, making chances existing lamps and making querys of features and quatities of existing lamps |
| Involved in the process (within organization) | Infrastructure planner, Assistant, Maintenance, Construction, |
| Involved in the process outside of organization) | Maintenance contractor |

| | |
|---|---|
| Support processes | Infrastructure planning, Infrastructure construction |
| Process owner | Assistant |

| Phase | Assistant | Infrastructure planner | Construction | Maintenance | Maintenance contractor | Additional information |
|---|---|---|---|---|---|---|
| **New lamp/Change of existing lamp** | Updates the information to the map | Use the information in infrastructure planning | Orders installating of lamps from | Decides the changes to existing lamps, orders changes from contractor and informs assistant when work is finished | Carries out ordered changes and informs the suscriber when the work is finished | |

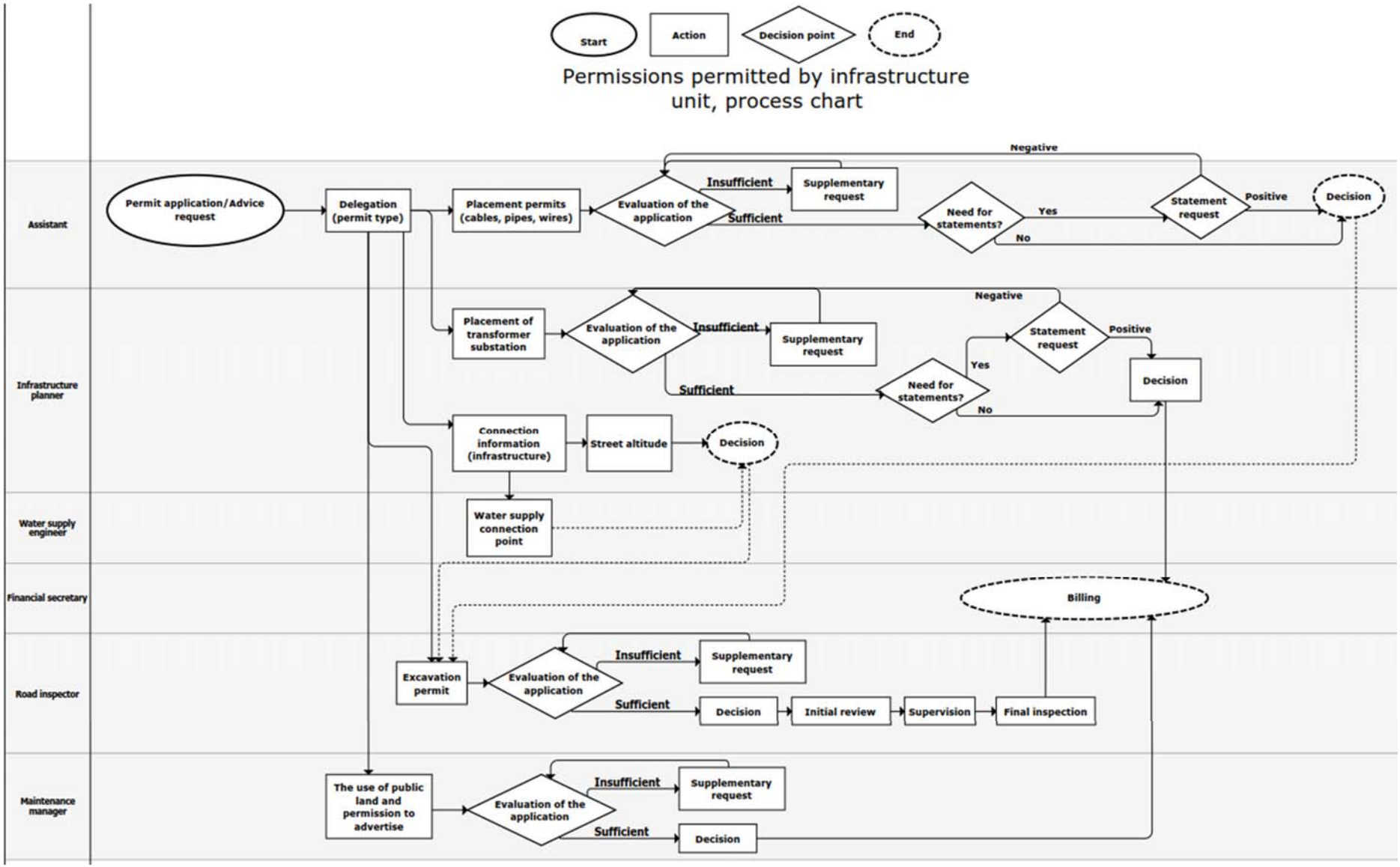
**Documents created during process**
Document 1 - archived to: XXX
Document 2 - archived to: XXX

**Documents linked to the process**
Document 3 - archived to: XXX
Document 4 - archived to: XXX

**Safety issues to be considered**
High places in lamp installations
Electrical safety

**Environmental issues**
No none issues

**Legislation and guides linked to the process**
Act on the maintenance and cleanliness of streets and some public areas


Start
Action
Decision point
End
Permissions permitted by infrastructure unit, process chart
Assistant
Infrastructure planner
Water supply engineer
Financial secretary
Road inspector
Maintenance manager
Permit application/Advice request
Delegation (permit type)
Placement permits (cables, pipes, wires)
Evaluation of the application
Insufficient
Supplementary request
Sufficient
Need for statements?
Yes
No
Statement request
Positive
Negative
Decision
Placement of transformer substation
Evaluation of the application
Insufficient
Supplementary request
Sufficient
Need for statements?
Yes
No
Statement request
Positive
Negative
Decision
Connection information (infrastructure)
Street altitude
Decision
Water supply connection point
Billing
Excavation permit
Evaluation of the application
Insufficient
Supplementary request
Sufficient
Decision
Initial review
Supervision
Final inspection
The use of public land and permission to advertise
Evaluation of the application
Insufficient
Supplementary request
Sufficient
Decision