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PROCESS ANALYSIS OF FINANCIAL SERVICES COMPANY

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ABSTRACT

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The goal of the thesis is to study and develop business processes in a financial services company. The commissioner of the work is the Monetra Oy in Oulu.

In the first phase the current state of processes is examined based on interviews of the key people in the company. At the starting point, the main key processes are identified based on services each team in the company provides to customers. In the second phase the analysis is conducted and the improvement areas are identified, in both processes and management methods for process development.

The theoretical foundation presents concepts and methodologies relevant to reasoning of the documentation work, process description techniques, consideration of particular characteristics of people centric processes and finally process improvement practices.

In the results section the execution of the work is explained and the findings of the analysis are introduced. The result is a documentation of business processes assigned for the study, and an analysis report with a collection of recommendations for future development actions.

The main essential financial terms are described in the appendix.

Keywords: Process development, Quality management, Accounting

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1 INTRODUCTION

1.1 Business of Monetra

Monetra is a financial services company founded in 2012 by the city of Oulu and the Health care district of Northern Ostrobothnia. Monetra's mission is to provide financial and human resources management services to public sector organizations, mainly in the Northern Ostrobothnia region. The customer base has grown rapidly, and now includes smaller municipalities and several public infrastructure companies operating in business areas like electricity, water, education and harbor services. All the customers are also shareholders of the company, and most of the employees have come to Monetra by a transfer of business. Due to the company foundation and ownership structure, the financial focus is on cost reduction rather than profit making, which enables very competitive pricing for services.

The services Monetra provide include general accounting, sales ledger and invoice handling, purchase ledger together with invoice processing, money transactions handling, travel and expense bill handling, payroll administration, and technical administration of financial processing systems. Consultancy services are also available for different training needs, for example collective labor agreement problems or closing of the books at the end of the accounting period. (Monetra.fi 2014, section "palvelut".)

The vision of the Monetra is to be the most desirable partner in financial administration services for public sector organizations in northern Finland. Monetra would be known for its devoted service attitude, cost efficiency and consolidated IT systems. The strategy to achieve the vision is divided into four main topics; partnership, expertise, efficiency and motivation of the personnel. The partnership is based on trust and tight integration with customer, enabling pre-emptive service providing and early problem identification. The expertise is shown by courage to present the state of the art operating methods, and find the best solutions for customers. The efficiency is based on utilizing the most effective tools and systems, and maximum use of automated IT systems. The experts are encouraged to find proposals for improvements and develop new ways of working.

1.2 Need for Process Documentation at Monetra

There are several practical reasons why processes have to be defined and documented. Identified needs for process descriptions stem from internal new employee introduction training, communication with customers, and demands from official parties such as accounts auditor. Common to all requirements is the benefit of having a holistic view of the whole service chain.

The corporate governance (Finnish Corporate Governance Code, 2010) rules require internal monitoring of company's own actions, especially when dealing with money transfer, which is the case in the Monetra. Therefore, there is a need to bring different acceptance steps visible in the process documentation. That gives management a sufficient base for evaluating risks and planning actions to mitigate those. An accounts auditor typically has similar official requirements, the basic need is to verify that there are no obvious risks in acceptance and money handling process, for example cases where the same person can create and accept purchase orders. In addition to external requirements, running the business calls for comprehensive understanding how the strategy is being implemented in practical terms, and how internal quality control can be applied to achieve the best results.

Customer communication is one important way of using process descriptions. In many cases processes of a financial services provider typically involves several parties, including the company itself, the customer, a bank, an IT-service provider and other stakeholders. Some parts of the process are usually not directly visible to parties beyond corporate interfaces, so it is important to have a way to explain those parts of the process to the customer in a visual manner. A big part of a customer communication is training. In case of Monetra, many services include software or a web based service which customers use when performing their financial operations. Therefore trainings are held for the customer to educate new and existing employees about the use of the service. A visual description of the whole process is a good tool in training, giving people broader view why their part of the process is important and what is expected from them to perform next steps properly.

1.3   Starting Point of Work

Discussion about the need of the process documentation in the company had started already almost two years ago. A pressure to create documentation was coming from both outside of the company and from practical reasons in new employee familiarization.

There have been two separate attempts to fulfill bare minimum requirements. At the first attempt, minimal process charts were drawn with Microsoft PowerPoint, using one slide for one general topic without having proper connections between separate topics. Topics were very general, for example "Bank statement handling", "Payment of bills" and "Cash payments". This approach served the purpose of demonstrating customer acceptance steps to the accounts auditor and other governing parties. Using PowerPoint slides turned out to be inappropriate for other purposes and the drive for further development faded away.

The second attempt emerged from an internal need for improvement actions. After examining the results of an employee survey, it was recognized that both employees and management lacked the common understanding about the overall picture of the processes. The demand for guides, instructions and information were picked by employees among the top three things to improve in their work. As a result, a separate IT system for process documentation was acquired from a service provider, and proper work for process thinking was started. The main processes were identified based on services offered to customers, and information gathered to earlier PowerPoint slides were copied to respective parts of the process map. As the documentation tool was better, after some refinements the connections between topics become visible and descriptions started to look like proper processes. However, despite the need for detailed documentation the work halted due to time constraint of people in charge. After a stagnation of half a year, the idea emerged to offer the task for someone outside as a thesis work. (Ritola Timo, Discussion 30.04.2014.)

1.4   Demarcation of Topic

The objective of the thesis is twofold. The first objective is to document the current state of processes in enough detail to cover needs discussed above. Since the existing process documentation system is available, it will be used in creating and storing the documentation and other options are not considered. Information about processes is mainly obtained by conducting interviews of team leaders and specialist, also work instructions and other written documents are utilized. The style selected for process documentation is visual flowcharting, since it is commonly used to describe processes and is the most intuitive solution. Therefore, any other written documentation possibly needed in some situation is out of the scope of the thesis.

The second objective is to find development options for improving performance of either individual processes or company level operations. Due to the expert consultative role of the company, improvement options can also be extended to the customer side of the processes. This is achieved by analyzing processes, work and management methods. A conclusion report of findings will be presented as a product of the second phase. Any implementation of the proposed actions is out of the scope, as well as detailed investigations of the root causes of findings.

Two separate theses are done for the company around this topic, one for the general ledger part of accounting and money transactions handling, and other for the subledgers. The general ledger is a collection of transactions done in subledgers, and the main storage of the bookkeeping records. Producing obligatory financial statements, including balance sheet and cash position monitoring is the main function of the general ledger. Subledgers are a list of financial transactions that take place when an organization makes a purchase or a sale. The analysis in this thesis will focus on subledgers, meaning the processes that take place before transactions roll to the general ledger, including:

- Sales ledger and billing
- Purchase ledger together with invoice processing,
- Travel and expense invoice handling,
- Payroll administration

A brief description of these operations and accounting in general is explained in sections 1.5 to 1.10.

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1.5 Accounting in General

All companies in Finland are obligated by the law to keep track of all financial transactions executed (Accounting Act 1997, 1§). The reason is to be able to share proven information about the financial position and performance of the company to stakeholders like investors, creditors, regulators and also to own management. The idea for accounting is probably thousands of years old, and principles of double entry bookkeeping used today are dated back to medieval Europe. (Karvinen 2000, 5)

The difference between accounting and bookkeeping is in the intelligence of the function. While bookkeeping is a term describing the process to record transactions, accounting is a more broad term including design of the bookkeeping structure and preparation of reporting. Merely recording of transactions may be sufficient to fulfill the legal requirements, but more is expected by a company's internal customers. (Tracy 2008, 18-19.) That is why a reporting part of accounting is commonly divided into two functions, external financial statements and internal management reporting.

The minimum level of external reporting depends on the legal form of a company, listed companies have quite strict requirements for disclosure, but private practitioners are sometimes required to report only to tax officials (Accounting Act 1997, 7§). Other than government authorities, external reports are important to parties providing credit or capital to the company, including banks, investors and suppliers. The information is used to assess credit risk. In other words the purpose of reporting is:

"Give us your money, and we'll give you the information you need to know regarding how we're doing with your money." (Tracy 2008, 250.)

The need to know -part is what separates external and internal reporting. There are lots of things that companies are not willing to disclose for competitive reasons, like sales prices of products or services, or prices paid to suppliers for material. That information could be calculated from too extensive reports, thus hampering competitive advantage. However, management of a company needs to be informed about such facts, so there has to be separate, more comprehensive reporting extending to a very detailed level.

The detailed information is produced in different business processes, then gathered to an accounting system in subledgers and finally put together in a general ledger. Figure 1 illustrates the information flow to a general ledger.
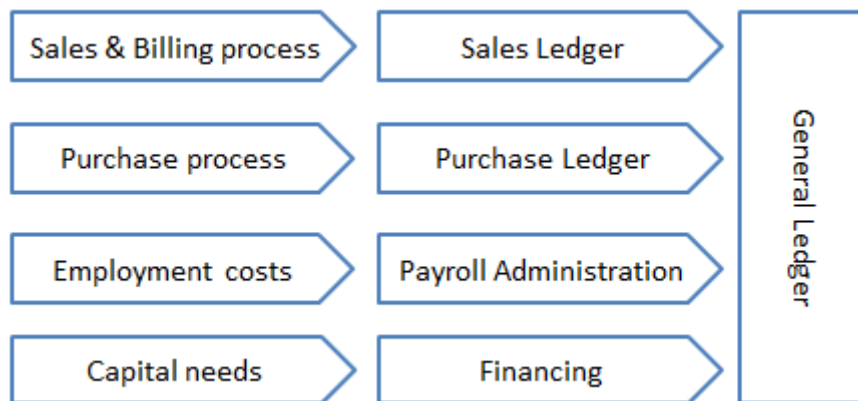
FIGURE 1. Information flow in an accounting system

1.6 Purchase Ledger and Invoice Processing

A purchasing process starts from the need to acquire products or services from outside of the company and ends in archiving of the accounting records relating to the purchase. Typical steps in a purchasing process include:

- Order and delivery of the goods
- Receiving an invoice
- Posting the invoice to purchase ledger
- Invoice check and approval
- Paying the invoice
- Reconciliation of accounts
- Archiving (Lahti & Salminen 2014, 52-77.)

A purchase invoice processing is usually done with a separate IT system, where invoices are either received already in digital form, or scanned from paper. That way the check and acceptance can be done in the system, without physically circulating documents. Organizations constantly receive incorrect or even fraudulent invoices, so everything has to be separately checked and accepted by a person accountable for the purchase. As big organizations receive very large amounts of invoices and have many people making purchases, finding the correct acceptor is the biggest challenge in the purchase invoice process.

A purchase ledger, also known as accounts payable, is basically a list of invoices that a company has received. Posting is an operation where accounting information, for example a cost center, is connected to the invoice. This is usually done in the invoice processing system, which is connected to an accounting system to synchronize the information.

The bookkeeping accounts have to be reconciled in certain time periods, to ensure correctness of bookkeeping records. Reconciliation is a procedure to assess whether the balance of an account is correct. For example the sum of paid invoices in the purchase ledger must match the amount of cash withdrawn from the bank account for payment. If they do not match, either some planned payment is not made, or payment is done, but is not recorded in the purchase ledger.

1.7 Sales Ledger and Billing

Sales and billing process is crucial for an organization, since it is usually the single source of income. Proper handling of the process ensures that income is received from all sales activities and without unnecessary delays. (Lahti & Salminen 2014, 78-100.) A billing process can be seen as an opposite of purchase processing, the first is about sending invoices and receiving money, the other is about receiving invoices and paying.

Billing process can be divided into six major phases:

Creation of a bill
- Sending the bill to a customer
- Archiving the bill
- Posting to a sales ledger
- Keeping track of payments
- Reconciliation of accounts

As a purchase ledger is a list of received invoices, a sales ledger is a list of sent invoices. The main purpose of the list is to follow that all the bills that are sent are also paid. The most time consuming operation with sales ledger is a debt collection related to unpaid bills, and settling of unclear payments. Most of the invoices include a reference number, which the customer enters into the payment system and bank includes in a bank account statement. The reference number can then be used to automatically match invoices and payments, making bulk of transactions close without human interaction.

The most laborious work in an automated sales ledger is investigation of payments that are not matched automatically. Usually this occurs when an incorrect sum is paid, a bill is paid twice, or simply the reference number is missing. If too much money is received, the payer has to be found and the extra money returned.

Keeping track of unpaid bills can be automated for the most part. An accounting system typically has a function to list invoices that are overdue, and generate reminders. A debt recollection process is the last option for unpaid bills, usually done by private collection agencies or public recollection enforcement officials. (Lahti & Salminen 2014, 97.)

1.8   Travel and Expense Claims

Travelling is a special case of a cost for an organization, since the cost is reimbursed to an employee, but the payment is not a salary. In smaller organizations the travel expense process is part of payroll, but when the amount of people travelling increases, it is preferable to have a separate system for travel management. Typically also other small purchases can be reimbursed using the same system. (Lahti & Salminen 2014, 101-115.)

In Finland there are legal rules for tax free compensation of time and resources spent by an employee during a business trip. These compensations include for example daily allowances and usage of an own car. Other costs may include hotel bills or flight tickets, which are either paid directly by the company, or reimbursed to the employee.

Common phases in a travel expense handling process are:

- Travel planning
- Compiling a travel claim
- Receipt check
- Payment
- Posting to an accounting system and reconciliation

A travel plan is used for approval of the trip, including checks of compliance of company specific travelling instructions, including for example price of hotel rooms or flying in business class. In an electronic travel management system, the plan is created directly to the system, and converted to a claim after the trip. Sometimes the planning phase is omitted if a company does not require approval for travelling beforehand, especially in case of short and low cost trips.

In the travel claim, a traveler documents all the costs incurred during the trip, attaches receipts for bookkeeping purposes and sends the claim to the approver. Daily allowances are calculated based on trip destination and length, and other reimbursements are paid according to receipts.

Managerial accounting, meaning accounting and reporting for the purposes of the company's internal cost control, is usually the most complex part of bookkeeping related to traveling. There are many ways costs can be allocated and monitored, not always planned very carefully. In a typical organization, total travelling cost per employee is not significant compared to other expenses, so the process may have been neglected. However, the total cost for the organization can still be quite remarkable and an abuse of the reimbursement process is possible, which causes the need for monitoring. (Lahti & Salminen 2014, 101-115.)

1.9   Payroll Administration

According to a concise definition, salary is a monetary compensation paid based on time used or amount of work done. In practice salary consist of a variety of separate increments based on legal or contractual obligations.

Considering the amount of the work done, payroll administration is one of the most demanding operations in a financial department. Due to different labor contracts, employment contracts and types of the work done, a salary calculation process has many phases and tasks that require lots of effort. There are also many connections and reporting obligations to stakeholders such as tax authorities and insurance companies.

When a payroll management system is properly automated, calculation and payment are rather compact parts of the process. The largest part of the job is about gathering information about changes in employment, amount of hours worked and other factors relating to salary. After all, the information is interpreted to the system, simply a payment run is executed to finalize the process.

Gathering of information is usually done in a separate time tracking system, which can be a part of a work shift planning system. Many times a supervisor has to check the hours worked before they can be moved to the payroll system for processing. This time

based information still needs to be interpreted, for example, if extra working hours are between flexibility limits, or if overtime compensation has to be paid. Vacations, sick leaves, maternity leaves, study leaves and other absences require separate handling and many times there are special calculation rules for each type and at worst for each employment type as well.

Mandatory reporting plays a big part in the payroll, as well as obligatory payments of, for example, withholding tax, health- and pension insurance, labor union fees and so on. Different kinds of reports are delivered to employees, management and government officials, either monthly or yearly. Reporting can be comprehensively automated at best, but especially company internal reporting needs tend to be increasing all the time. (Lahti & Salminen 2014, 135-149.)

1.10 Accounting Services in Value Chain

Accounting and other financial operations are categorized as a support function in the organization providing products or services to customers. In the Porter's value chain model (Porter 1985, 33-47), financial operations belong to the infrastructure category together with general management, quality, legal, etc. Even though infrastructure may be considered as an overhead increasing company costs, according to Porter, a proper support function can also provide a major competitive advantage. In order to create an advantage the function has to add value to primary activities. Accounting operations are categorized as indirect value adding actions, as their primary way to increase competitive advantage is to provide information which would help management understand the organization's financial position and balance of costs and income.

The accounting functions are most commonly outsourced services, although many times limited to most clerical operations. Many of the accounting areas are good candidates for automation, so there are volume benefits in centralizing such functions. After the basic accounting processes have been automated there are no feasible competitive advantage possibilities left and functions can easily be outsourced since they have no strategic purpose for the organization. Higher level operations like auditing and reporting should be considered more carefully, since they require understanding of the particular business the organization operating in. (Bragg 2011, 363-381.)

2 THEORETICAL BACKGROUND

2.1 Purpose of Process Documentation

Every management system requires certain amount of guidance, methods to follow the process and reports to assess the outcome. The danger is that these necessary means of control and communication evolve to bureaucracy, and creation of documentation becomes the capital purpose of the organization. (Multimäki 2003, 39-41.)

The amount of documentation required to run a business in the most effective way is a controversial subject. A good target is presented in a case study by Fülscher & Powell:

> The goal of the workshop would be to develop process maps for the auto insurance business that covered 80 percent of individual cases. In other words, the purpose was not to develop a detailed description of how Secura would handle every aspect of every future case, but rather to develop a new business concept at a high level of generality (Fülscher & Powell 1999, 213.)

Trying to document every exception would obviously be a very complex task, and probably only creates an outcome that is unusable in practice. All documents should have a purpose and should be created to be fit for the purpose.

Evidently documentation is needed, but the extent is varying depending on the mindset. As Martin Brady allegorizes it in his article (1994.):

"Documentation is to business as [sheet] music is to an orchestra"

Considered how obviously difficult it would be to make an orchestra play a new symphony without notes, it would be strange if a company of the same size as the orchestra would try to manage its business without documentation. As a musician well prepared to perform the act would probably know the music without notes, an experienced professional would know the work task without instructions. For both a symphony and a company, the documentation has only two functions:

- Training
- Reference (Brady 1994.)

Realizing and digesting this is a decisive step in limiting excessive bureaucracy. Every employee needs to be more or less trained for the job, and after using the documentation in this purpose, it is stored for later use as a reference. Unless no other use for the documentation is found, documents have to be designed only to fulfill these needs. (Brady 1994.)

The other event employee needs to be aware of, is when something changes and the documentation is updated. The person responsible of the document is usually also the responsible for communicating changes to users of the documentation. Large updates to the operation procedures many times require separate training, and then new versions of documents are fulfilling their purpose. For smaller changes, it can be unclear who would need to know about the changes and how to communicate them. (Brady 1994.)

Distributing updates to everyone separately poses a problem if control of versions used is not properly in place. Paper copies of documentation are particularly difficult to manage, since old versions can be left lying around and there is no easy way to notice if a copy is up to date or not. An established practice to ensure that the documentation is not out of date is to ban the storing of paper copies and keep documentation only in electronic form. Where usage of paper copies cannot be avoided, number of copies should be kept low and care has to be taken to destroy old versions immediately when a new version is taken into use. (Brady 1994.)

2.2   Benefits of Process Documentation

The purpose of the process description is to represent the logic of the functionality of the organization. (Laamanen 2001.) Understanding the logic is required to find the critical sections in company operations that help achieving essential business targets. That way the development actions can be focused on the right places and unnecessary suboptimization can be avoided.

Case studies of extremely successful companies many times show that their success is not caused by overwhelming innovation skills or radically different business models, but their investment on process manageability and continuous improvement of their business. (Singh 2011.) Taking small development steps one after another for several years or even decades will eventually lead to world class business execution.

Understanding the statuses of the existing processes is elementary for any development to take place. As operational efficiency is on the agenda of practically every manager, process descriptions are a welcomed tool for process refinement. Analysis and understanding of the process flows gives business developers a view if there is a room for improvement and provides a starting point for collecting improvement ideas. Involving a larger group of people taking part in development requires efficient communication and a common ground for basis of development and a new direction setting.

Process documentation is a self-explaining tool for sharing understanding of both the current state of the process and propositions for a new mode of operation. In his article, Singh stresses the importance of common unified language and methodology process descriptions provide when exchanging ideas and information about processes and decision rules. Communication is not essential only for process development, but also for many other important purposes, including customer communication, new employee familiarization and regulatory compliance demonstration. Process documentation can give teams and individuals a clear view what is their role in the organization, what is expected from them as well as how they are supposed to carry out their tasks. Especially new employees can benefit from documentation, since they can quickly find out what to do in a new situation they may face, and reduce the time and effort needed in familiarization. There are even risks in not documenting processes. If knowledge and understanding are only stored in the minds people, for example loss of staff may lead to big problems. Turning the team's experience and tacit knowledge to documentation can be a major risk mitigation action, let alone important for growth of the company. Documented and shareable knowledge will enable business expansion by utilizing the ability to increase capacity by replicating processes. (Singh 2011.)

2.3 Process Dependencies

Identifying dependencies is probably the most crucial part of a process management. The amount and variety of dependencies is extensive and it is not always easy to figure out how they should be handled. Having a categorized set of dependencies can help identifying the best solutions for coordinating them.

Hakulinen describes in his thesis (2008, 22.) a case of a documentation company that has taken in use a novel approach of modelling team level actions and surroundings. A process description has been divided into two separate documents; one is an actual process description where dependencies of actors, documents and process steps are described. The other is a separate team description, where the focus is on a larger group of people, for example a team or department. This description can include dependencies to a surrounding environment, such as tools and other infrastructure used, a customer, contact persons, IT systems and so on. A team description has a link to processes the team is involved and a process description has a link to teams executing the process. They state that this approach is useful for keeping actual process descriptions simple, while also capturing all the factors affecting the process.

Crowston has formed a theory about categorizing dependencies to groups and specific coordination actions to mitigate them (2003). In this approach, dependencies are conceptualized to arise between tasks, rather than actors performing the task. The main view of the theory is to see the need for coordination as a response to problems caused by dependencies. The dependencies are divided into three task-resource dependencies, including shared resources, producer-consumer and common output, and three types of task-task dependencies. These dependencies are explained in the following sections.

2.3.1   Shared Resource

When two tasks are dependent on the same resource, there might be a need for mechanisms to control the use of the resource. The need originates from the two dimensions of dependence of the resource, as depicted in Table 1. (Crowston 2003.) Shareability of the resource defines whether it can be used at the same time by multiple tasks, provided that it is not changed by the tasks. Different forms of information are typically shareable, as well as a variety of software based tools and systems. Reusability represents the property of consumability of the resource, in practice if it can be used or not after other task has finished. Raw materials and other inputs that are altered by the task are not reusable. One important aspect of non-reusability is information that is changed by the process.

TABLE 1, Resource shareablity matrix (Crowston 2003)

	Shareable	Non-shareable
Reusable	Information, guides, reports etc.	Meeting rooms, tools
Consumable	(Not possible)	Raw materials

Naturally, shareable resources do not require any mediation between users of the resources, because no conflict is caused by simultaneous use. Tasks that are dependent on a non-shareable and reusable resource cannot be executed at the same time if additional resources are not acquired. Therefore, a scheduling system has to be implemented to coordinate the running of the depending tasks. Scheduling often requires a lot of work, and conflicting interests may arise, especially when prioritization of the tasks is needed to accomplish optimum results.

The analogous problem, mutual exclusion, is well studied in computer science, so mechanical rules and theories for mitigating it are abundant. For example Kshemkalyani and Singhal describe three basic requirements for distributed mutual exclusion algorithms:

- Safety: At any given time, only one actor is allowed to use the resource
- Liveness: None of the tasks must not be left endlessly waiting for the resource
- Fairness: Every task has to get a fair chance of using the resource (Kshemkalyani&Singhal 2008, 6.)

Any implementation of mutual exclusion consists of a reservation indicator, which is used to prevent simultaneous use of the resource. Physical resources such as meeting rooms are evidently in use or not, while intangible resources need some kind of information sharing mechanism. Many kinds of information technology tools are available for the purpose. Maybe the most difficult challenge in practice is the scheduling, including prioritization, which task has precedence over another. Tasks can be arranged by time criticalness, customer needs, profitability and similar methods, but care must be taken to avoid preventing of lower priority tasks from executing entirely. For fair and controlled scheduling, a task queue or similar system for reserving a resource for future use can be implemented. The meeting room is again a good example, typically there is a reservation list where use of the room is marked, but a customer meeting may take precedence over an internal meeting.

2.3.2 Producer-Consumer

As a process can be described as a series of interlinked tasks, it is evident that many tasks have to be executed consecutively because the output of one task is an input for the next task. According to Crowston, this dependency is used in managing the order of execution of the tasks, as well as the flow of required resources. (Crowston 2003.) The producer-consumer dependency generates additional requirements for the task. Most importantly, it has to be ensured that the output of the first task matches the needs of the second task as an input. This can be mitigated by careful negotiation between task owners, either specifying the input and output requirements in detail, or giving more information about needs and available options. Many quality control practices also address this topic, and can be used in continuous development. Another challenge is the inventory and timing of execution of dependent tasks to prevent the second task running out of the input material. A usual way to assist in this situation is to add buffers between the tasks, and when it is not possible, link production speeds of the tasks together.

Again, there is an analogous problem addressed in computer science, a situation where the first task is producing into a limited size buffer and the other is consuming the buffer (Wileman 2008). The basic problems are, how to stop the first task when the buffer is full, and how to prevent the second task from consuming from unfinished buffer. The simplest solution requires both parties to poll the buffer constantly; the first if there is a room in the buffer and the second if there is information ready to be used. A more sophisticated solution consists of complicated two-way communication where a party that cannot continue working will stop until a message arrives informing that a new resource is available. The complicated part is to address situations where a message gets lost or has been forgotten to send. Luckily humans are better at noticing when some process has halted completely.

2.3.3 Common Object

Sometimes, two or more tasks are working on the same object. The situation is similar with the shared resource problem, but actions to solve the problem are different. In Crowston's model, a primary resolution would be to abolish or merge the other task, since they already have a natural synergy. Also, reducing the number of different tasks

would bring economics of scale to the rest. On the other hand, if two tasks are responsible for different features of the object, it may be necessary to keep the tasks separate and agree on mutual understanding of common output. Furthermore, the work done simultaneously to the same object has to be carefully managed by both parties. A typical problem is a situation where a resource needed by one task is blocking the progress of the other. The construction sector faces this kind of challenges constantly, when a large equipment is blocking the access, ditches and holes are excavated, concrete is hardening, paint is drying etc. In some processes a required resource is even destroyed, inadvertently or in purpose, by the other task. Planning for this kind of work requires distinct focus on the order of events and reordering of work, to prevent unnecessary delays or doing overlapping tasks. An entirely separate type of a common object problem is a situation where two tasks have exactly the same output. This kind of circumstance may occur because of capacity or geographical reasons, when it is reasonable to do the same work on multiple locations. The main challenges that need addressing are raw material and inventory information synchronization, which may be needed before producing or shipping products.

2.3.4 Task Dependencies

One task – multiple resources -dependency occurs when a task may need more than one resource at the same time, for example raw material, tools and workspace, to be able to produce the output. If one or more resources are constrained, tasks have to be scheduled in a way where a task does not need to wait for the availability of the required resource unnecessarily long time. According to Crowston, this dependency seems to be less problematic than previous dependencies; the solution only requires synchronizing the availability of the resources. When resources are not constrained, conflicts are not happening since resources can be permanently assigned to a given task. Human resources are typically more difficult to synchronize than concrete objects like tools, since people may have different goals and priorities. For example, a meeting can be modelled as a situation where several people are reserved for a certain time period to work on the same meeting task simultaneously. Usually when scheduling a meeting, the most difficult part is to find a time when all participants are available to attend. As with

every other resource, planning of the use of human resources is more likely to be successful when an operational authority has set the common goals and priorities.

Multiple modes of use -dependency is for modelling of a situation where an input and an output of the task are the same resource, in other words the task is modifying the input resource to produce the output. The same resource can travel through the process several times, as a task treats it in a different way in each round. The simplest example is a production line where a product is returned from quality inspection at the end of the line to the beginning of the line, but this time fully assembled. Another aspect of the multiple mode of use –dependency is use of a resource in different ways by two different tasks. For example in a baking task, an egg can be a resource from where one task may need the egg white and other task may need the egg yolk. It is important to understand that while the inputs for both tasks are different, they are still dependent on the same bigger input resource.

2.3.5 Coordination of Dependencies

Crowston presents a framework for analyzing suitable coordination mechanisms to mitigate different kind of simple dependencies. A summary of the framework is illustrated in Table 2. More complex dependencies need a case to case analysis of the types of resource conflicts between tasks.

TABLE 2. Summary of dependencies and coordination mechanisms. (Crowston 2003.)

Dependency		Coordination mechanism
Shared resource	A task uses a resource	Resource assignment, reservation and marking resources for use
	Shareable resource	(No conflict)
	Reusable resource	Make conflict visible, schedule resource usage
Producer-consumer	Same resource	Task ordering to manage flow or resources
	Conflicting resource	Reorder tasks, or add an extra task to modify the conflict
Common object	Same output	Find ways to merge tasks, or schedule which task to run
	Overlapping	Negotiate mutually agreeable output
	Conflicting	Prioritize and select

2.4 Interdependency in Process

In addition to dependencies between a task and a resource in the process, the other perspective of dependence is between the tasks. While resource constraints are very concrete obstacles in process design, the relations of the tasks itself are more abstract and maybe more fruitful to examine in theoretical level.

Moving from a traditional manufacturing process type of work to the world of service processes, concreteness fades out and people interaction becomes the center of the process development. Therefore, it is relevant to examine process models considering not only dependencies between tasks, but also between actors of tasks. Crowston's model examined relations through resource conflicts, here a different angle is used to look for interrelations.

2.4.1 Interdependency of Tasks in Process

Different tasks or sub-processes in a process can be divided into two groups; those which are interdependent, and those which are independent of other tasks. The separation of those two is needed because the methods and actions available for process improvement are different. This is especially important in a case where a part of a process is performed out of direct company control, for example actions needed from a customer. Interdependent tasks crossing company borders tend to need much more management time and resources, and also require a lot of effort to develop and change.

Puranam&Raveendran (2012, 3) define task interdependency as:

> Two tasks are interdependent when the value generated from performing each is different when the other task is performed vs. when it is not. The tasks are independent if the value of performing each task is the same whether the other task is performed or not.

With this definition, one cannot expect that the value generated when performing both interdependent tasks is always higher than performing only either one or the other. The value of one task relating to other interdependent task is typically lower when the outputs of both tasks are substitutes to each other. The higher value is usually generated when outputs are complimentary. The most common type of interdependencies is an

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asymmetrical interdependence, where the output of the first task is input for the second. It is important to recognize that the second task is always interdependent with the first, but the first can be independent of the second. Dependence is depending on whether the value of the first task increases when the second one is performed.

2.4.2   Interdependency of Actors in Process

In addition to task interdependence, there are also interdependencies between actors performing the task. According to Puranam, Raveendran & Knudsen (2010, 9-10.), actors' interdependence stems from different situations of actors relating to rewarding. They define actor interdependence as:

"Symmetric interdependence exists when the reward to A from A's actions depends on B's actions and vice versa."

Correspondingly, asymmetric interdependence is formed if the reward to A from A's actions depends on the actions taken by B, but B's reward does not depend on A's actions. (Puranam, Raveendran & Knudsen 2010, 9-10).

The reward interdependence has been extensively studied in social behavior research, starting from ground theory by Kelley&Thibaut (1978), and more generally in game theory starting from von Neuman & Morgenstern (1944). From more recent research, it can be summarized that it is the task interdependence, not reward interdependence, which drives positive cooperative behavior (For example Wageman, R. and Baker, G. 1997).

2.5   Dependencies of Tasks versus Dependencies of Actors Performing Task

Two step analytic separation of the interdependence between tasks and actors are formulated by Puranam, Raveendran & Knudsen (2010, 5.):

"Interdependence between tasks need not imply interdependence between the agents performing these tasks; and interdependence between agents in turn does not imply a need for information processing between them."

They state that this separation is fruitful for several reasons including:

• Interdependence between agents can be modified by an organization designer, even when interdependence between tasks cannot be

• The structure of tasks and the structure of organizations may not resemble each other

• Organizations facing identical sets of tasks may have different, equally effective organizational structures

The optimal actions of one actor may depend on forecasting actions of another actor. This is called epistemic interdependence, meaning in practice dependence relating to understanding of reasoning and motivation of another actor. For forming an epistemic interdependency, tasks itself are not even necessarily interdependent. This is an important point, since it is the epistemic interdependence, rather than a task or an actor interdependence, which causes the need for information sharing between actors.

They also argue that it is the epistemic interdependence that process developers should pay more attention to, and create organization structures that help actors assimilate the needs and motivation of other actions relating to processes. Even better, with this understanding, the processes and organizations can be designed in a way where formation of epistemic interdependencies can be avoided.

2.6   Roles and Responsibilities

Ultimately, it is the management's responsibility to assign roles and responsibilities in an organization. Clear roles of who is expected to be responsible for what, are necessary for any controlled meaningful actions to take place. In the whitepaper published by Juran Institute (2014.), roles are categorized into four groups; *Responsibility, Accountability, Consultation* and *Inform*. This is also known as the RACI, or responsibility assignment matrix. For process development purposes, this can be expanded to a matrix known as RASCI, meaning that fifth group, *Support* is added as shown in Table 3. (Cabanillas et al. 2011, chapter 2.)

TABLE 3. Role categories. Induced from the Juran Institute (2014), Cabanillas et al. (2011, chapter 2)

Role category	Description
Responsible	These are people who are expected to actively participate in the project and contribute to the best of their abilities.
Accountable	This is the person who is ultimately held responsible for the project's results and makes the final decision.
Consult	These are people who can provide expertise when needed, can contribute to specific decisions, or who *must* be consulted before a final decision is made.
Inform	These are people who are affected by the project, but who are not active participants. They *must* be informed about decisions.
Support	People who have a duty to help the responsible person to complete the task

The most important question to consider is the difference between responsibility and accountability, especially when taking into account that the Finnish language does not even differentiate between those two (ITIL sanasto 2011, 89,93). Searching "RACI" on the internet blog sites yields similar remarks from some other languages as well, so the problem seems to be widespread. There appears to be no official definition for these two, so for the purpose of this paper, the main characteristics of them are defined in Table 4.

TABLE 4, Characteristics of accountability and responsibility

Accountability	Responsibility
One can *held* accountable	One can *take* responsibility
Implies personal retribution for failure	Not personally liable
Cannot be handed off	Can be delegated
Indivisible	Can be shared
Must control actions of others	Focus on own actions
Fulfills external requirement	Internal motivation

Consultation and Support roles can be easily mixed up, a care must be taken to clearly separate these two when assigning roles. The difference is that a consultant is a role who provides information and contributes to decision making, whereas a support is someone who helps accomplishing the task by actively participating to the activity. (Cabanillas et al. 2011, chapter 2.) In a process description, a task requiring input from people with Consultation or Support role should be modelled as a sub-process. In that way it is possible to describe a process flow where resources and responsibilities of tasks can be assigned or delegated to correct roles outside the main process. Since people with the Consultation role are not actively participating in the active work, their contribution is modelled as request-response communication. Even if no value is created in this kind of a process step, it is time consuming work that must be included in a description. (Cabanillas et al. 2011, chapter 2.)

Informed role is simpler, since a response is not required and process flow is not affected. Nevertheless, the role is needed for ensuring that communication is a part of the process, and many times a very crucial part of it (Juran 2014). Usually customers, collaborators and other important stakeholders have the Informed role.

2.7   Soft Systems Methodology

Using hard process engineering methods with processes involving other than rigid technical production line –type of work has turned out to be difficult. Tools that are developed for technical problem identification and solving are many times failing to correct problems involving human affairs and management issues. The Soft Systems Methodology (Checkland, 2000.) has been developed to fill this void in process development. The methodology has been studied and improved for decades, so the benefits of it are quite proven.

Soft Systems Methodology divides the driving principles of change management into two different categories:

- An action oriented approach (hard), seeking the accommodations which enable the action to improve to be taken by people involved
- A sense-making approach (soft), which helps development by increasing the understanding of dependencies and human relations

In the action oriented approach, the focus is on finding change subjects and types of changes required to achieve desired results. Changes can be either structural changes, process changes, or changes of outlook and attitude. Typically a change in ways of working entails all three, and it is important to plan interactions between these three. Structural changes are usually in the field of the senior management, and therefore often seen abstract to ordinary employee. The reason for a structural, organizational change should be solely to enable the actual desired change to occur. Changes need plenty of time to happen even after a successful enabling action has been implemented, so it is not advisable to implement organizational changes very often, doing so would only disrupt the formation of practical process changes. Changes of outlook and attitude are seldom considered a part of a process improvement, since it is not very intuitive to improve something just by thinking differently. Nevertheless, it is quite often a requirement for any effective change to occur in processes around human interaction. For example, improved IT systems have enabled complicated tasks previously provided by other companies or people, to become a self-service. This has required people to overcome fear of difficulty of the task and start doing the task by themselves.

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The sense making approach concentrates on exploring how people are seeing their role and the work they do in relation to other parties, and what motivates their actions. The reason for having this kind of approach is to avoid the typical oversimplification of the process. The simplified logical step by step process is not always addressing important challenges preventing smooth flow of business, especially relating to human interaction. As an action oriented approach focuses on rather obvious individual problems, the sense making approach is working on holistic problems people find problematic in any reason. The aim is to find an accommodation to the situation, not necessarily a change to the process itself.

One important question to take into account in methodology is the influence of the process developer himself. The picture of the process is formed as an interpretation of the state of the business, more than an accurate description. This is evident in soft systems where observing the real world is not giving enough information; interviews of people are needed to understand the whole chain of actions. In systems engineering the usual approach is to observe and measure the system, all the information got by measurements are the facts and there are logical reasons behind all the facts. Conversely, in soft systems the observer has a delicate role of asking the right questions in interviews, interviewing the right people, working to look for complexity and confusion. The aim of the interviews is to dig out the underlying human reasons behind the obstacles and forming a learning system which will help increasing the understanding.

As the reasons behind the process problems unfold and the understanding increases, the research done for sense making approach will yield more refined problems which the action oriented approach can be used to work on. When the research is repeated over and over again, it will produce a learning system with continuous improvement, familiar with many other quality systems. Soft System Methodology can and should be used in parallel with such systems, it is not meant for replacing them.

2.8 Process Quality

Process improvement literature is so closely linked with quality management, that it would be very difficult to study processes without touching the topic of quality. Process improvement is only a one part of the quality management, but very essential in reaching quality targets. Therefore, conclusions for purposes of process development can be drawn from quality studies, since the level of quality is the result of the functionality of the process.

According to quality perception study conducted by Taloustutkimus Oy, in Finnish companies the most important aspect of quality is about providing a product or service that meets the customer expectation. Another important perceived factor is that the product or service is correct and error free. There are some differences between management and employee views, the management is addressing more to the customer perception of the company, when employees are focusing more on concrete products of the work. Common understanding to all is that quality is the most important success factor for practically all companies. Other important factors were flexibility, swiftness and only after those three came the pricing. (Taloustutkimus 2004, 4-8.)

Generally, both employees and managers are proud about quality of their products or services, especially in their own part of the process. Respondents also believed that customers are satisfied with the quality and that the quality objectives and expectations are met. The importance of the personal contribution to quality was recognized especially well in the services sector, probably because they are getting direct feedback from customers.

Among study participants, the biggest obstacles in creating quality were inadequate flow of information, time constrains and inefficient organization of the work. Again, the emphasis differs between management and employees. The management feels that the organization of the work is the biggest contributor, when employee position is that they are not getting enough information and have too little time to focus on quality. Employees are also highly valuing expertise and skills, and have a stance that the best way to increase quality is training, guidance and proper familiarization of the work. Particularly in service oriented business sectors, unified working practices and consistent customer service are seen as keys to good quality. Generally the involvement

and empowerment of personnel to be active in quality work is considered as the most important factor in quality improvement work.

The results of the study are depicting different points of view about quality between management and employees. The work done at the workplace, including planning, work methods, tools, skills and most importantly the product or service provided is at the center of employees view. The management who typically is more in contact with business customers is focusing more on the perception of the quality within customer relations, together with internal efficient execution of the work.

2.9   Responsibility for Improvements

General doctrines of who should take responsibility of process improvement have held time very well. Juran (1954, 6) has found two universal rules for assigning responsibilities.

"Responsibility for **restoring** the status quo rests with the [production] line organization"

When an anomaly occurs in the process, people engaged in the process are most capable of analyzing and correcting the root cause of the problem, given that they are authorized to make necessary changes to restore the situation. Management participation may only slow down and complicate the actions needed.

"Responsibility for **changing** the status quo rests with:
        a. The staff for planning the change
        b. The line for executing the change"

Large changes to the process often require a significant devotion of time to plan for the change. There may be a need to gather information from different departments, and the understanding of large entireties has to be gained. Usually people who are tied to productive work are concentrating on their daily tasks and have no time to spend on examining different options for changes concerning also other stakeholders.

That is why senior staff or management has to be involved in making more widespread changes. Planning of the changes requires special analytical skills, as well as a perspective for the whole organization instead of just one team. To be able to find solutions that accommodate the needs of different parties, a certain level of objectivity

is needed, since the optimum solution for the whole process can bring extra burden to some and resistance for the change may occur. (Juran 1954, 6-7.)

From the perspective of management, it is important to keep in mind that the focus of the development actions should be on structures and support, the employees are the ones developing the content (Laamanen 2001).

2.10 Personnel Empowerment

Operational development was earlier considered as a separate project that was primarily seen as an extra burden. Today the development is regarded to be an integral part of the actual work, and essential to the success of the company. The operational excellence is not created by individual heroic actions, or even heroic teams, but constant rational development of processes and working methods that create more value to the customer. (Laamanen 2001).

There are typically two kinds of work. When the system is stable and predictable, low level management is not needed; an actor has all the information to work independently. Another is more work in progress type of situation, where an actor has to wait for input from other parties, without knowledge what will happen in the future. Management has to be closely involved in the work. However, in specialist work that requires high level expertise, the manager's role is not to know everything better, but act as a coordinator of activities. Specialists can then focus their efforts on designing processes that perform at the highest possible level.

> …organization design may be seen as the interplay between the designer's knowledge of how to divide, allocate and measure tasks (architectural knowledge) and the agents' knowledge of how to coordinate their efforts (predictive knowledge). To maintain a given level of organizational performance, the two kinds of knowledge can act as substitutes. (Puranam, Raveendran & Knudsen 2010, 6-7.)

A common mistake made when moving away from tight management control it to leave employees doing their work and expect them to start developing better practices. Employees do not engage continual improvement without commitment from the top, a quality climate and an effective mechanism for capturing individual contributions. Development has to be managed, it does not happen spontaneously. Understanding and

commitment from senior management, effective leadership and teamwork are fundamental parts in the recipe for success. (Oakland 2003, 272-273.)

Juran has listed a few important elements to consider when thinking of how to empower personnel to start contributing to development.

- Awaken people to realize the organization's effectiveness is important to him personally

- Convince each person that he can contribute to the success

- Show to everyone individually, what he can do to make this contribution. This requires explaining what are the key points of the development and emphasize the right way of handling these key points.

- Stimulate everyone to give their contribution, by relevant means like bonuses

- Ensure that the improvement is permanent, by doing periodic audits to follow if the measures for improvement are still active. (Juran 1994, 5-6.)

2.11 Practical Steps of Process Improvement

There are many models how processes would be improved, but very few offer much more than a reordering of the principles stated in groundwork done by the founders of the subject like Walter Shewhart, Joseph Juran and Edwards Deming. One of those models is Arthur Schneiderman's "7-Steps of Process Management©", whose usefulness stems from its simplicity and practicality for planning improvement actions. As the name implies, the model is divided into seven steps as shown in Figure 2:
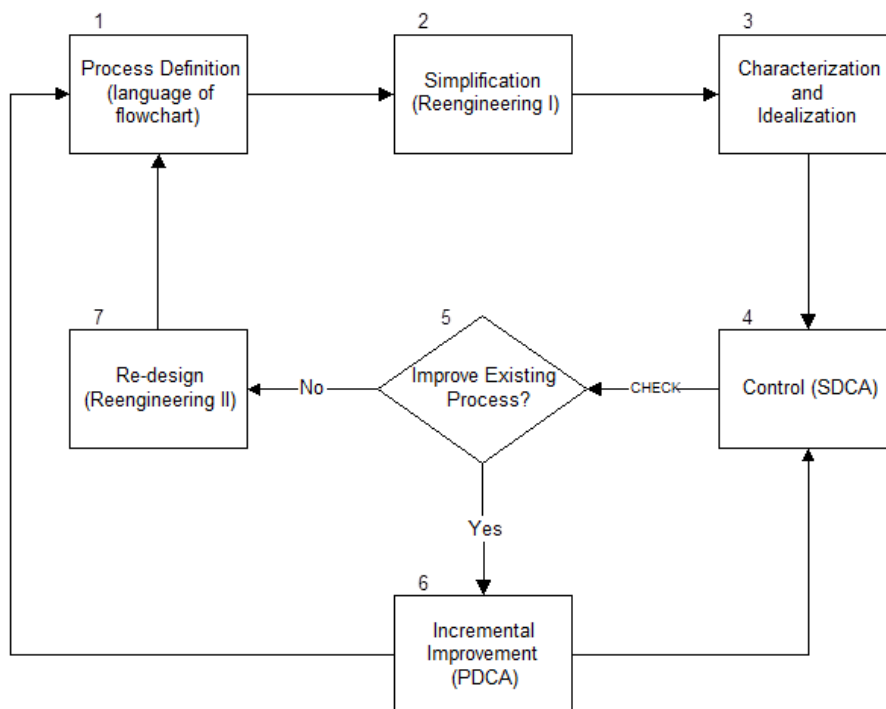
FIGURE 2. 7-Steps of Process Management (Schneiderman 2000)

2.11.1 Step 1: Process Definition

As discussed already in earlier sections, processes have to be described in a common language that is easily understandable to everyone, since discussion and communication are crucial for improvement.

"This is the key step in converting intangible (stored in volatile human memory) into tangible (documented) process knowledge" (Schneiderman 2000).

Everything that follows is built on the foundation of process definition, so this step is the one where a sufficient effort has to be invested to enable progression to next steps properly. It is also worth noticing that this step is not permanently left behind when finished, but continuously returned to when any changes occur as a result of the next steps. Definitions should not be in rigid form, but constantly reflect the current state of the reality.

2.11.2 Step 2: Simplification

The process development activities can be divided roughly into two conventions. The first deals with elimination of all activities that are not absolutely necessary to produce the expected outcome. The difficulty is to detect which activities are important and which are not. In the model, the focus is on figuring out the value that a certain activity adds to the outcome. An activity is not considered value adding if it is not fulfilling three specific conditions:

- The resource flowing through a process undergoes positive change
- The customer is willing to pay for it
- The activity has other purpose than just to correct an upstream error.

Additionally, the activities not adding value can be divided into two levels for better perception:

- Currently non-value adding
- Potentially non-value adding

For example, inspection steps are usually difficult to categorize, since their value is based on the likelihood of errors happening earlier in the process, as well as a cost of an undetected error. Before trying to eliminate such step, it is important to find the root cause why the step is implemented in the first place. Only after that it can be assessed if the root cause has disappeared and whether a task can be eliminated.

Currently non-value adding activities have typically at least been thought to add value, but they have become obsolete after time. For example, when taking a new tool or system in use, there may be many double-checks performed to make sure everything works as it should, and after deployment no one has remembered to give permission to

decrease amount of assurance. Also a new system may have made old practices unnecessary, but people continue to work as they have used to.

If the redundancy of an action is not obvious, it can be treated as potentially non-value adding. Before attempting to make any changes in this situation, there must be a way to tell the difference between before and after the change. According to Schneiderman, this is where measuring of the process becomes essential. Many non-value adding tasks even originate from improvement actions where an outcome of a change is not measured at all, or is measured in an inappropriate way. (Schneiderman 2000.)

2.11.3 Step 3: Characterization and Idealization

Unless properly measured, after a change has been implemented it can only be estimated what the result of the change was. The third step focuses on planning and implementing a process performance measurement system, and planning targets for performance. Careful planning on what to measure and how is important, because typically only the variable that is measured will improve. Some other variables may even become worse, so measurement should be comprehensive.

The performance of the process can be related to anything from fulfilling customer expectations to usage of resources. To be able to direct improvement actions towards the common goal, the management has to define targets for improvement. This can be derived from the company's vision and strategy, but usually more detailed guidelines are required. After the common direction is clear, metrics can be designed in a way where they keep the changes in the right track.

A good type of a measured variable in a process is independent on other variables, represents the characteristics of a process, is understandable and there are landmarks to compare it to. Generally metrics can be divided into two categories; those which measure the absolute value of a process attribute, and those which measure the variation of the attribute. Variation gives information about the reliability and predictability of the outcome, the absolute value is more a measure of current performance.

Every process has its absolute maximum limit of efficiency that can be achieved without a major redesign. Understanding the limit helps to decide rational targets and

priority of actions. An idealization of a process should be done to find out the limits, after that can be estimated what would be the cost of reaching the ideal situation. When the gap between the current state and the ideal situation is identified, ways to approach the ideal model can be planned. (Schneiderman 2000.)

2.11.4 Step 4: Control

Control step is required to prevent metrics or ways of working to slip back to the old system. The only way to measure efficiency comprehensively is to keep the process running in agreed way in every situation. A typical mistake is to fall back to familiar ways of working when problems occur, or skip measurement actions when in a hurry. Doing so would give the wrong impression of the performance, since metrics would only show a situation where the environment is stable. Staying with the process requires reinforcement from the management and supervisors, and proper communication of the reasoning behind the convention. (Schneiderman 2000.)

It can be a very difficult and time consuming mission to change the ways embedded in the culture, but there are many methods available for change management. Establishing the ways of working starts from existing skills, and capability of the individual to learn new skills. It broadens to team level practices where there is social pressure to act as expected by other team members, and extends to organization level culture.

Practical tools that can be used are for example written policies for standard operating procedures, well communicated process descriptions and up to date working instructions. Evidently, training and efficient communication are subjects to take proper care of to put into practice. (Pedasus 2012, 51-55.)

2.11.5 Step 5: Decision to Improve or Redesign

The decision to make a large reorganization is not always based on sound criteria. The options for gradual improvement of the existing process, and a complete redesign should be weighed carefully. There is always a reason why the existing process is not delivering the expected results, and if the root cause is not found it will most likely follow to the redesigned process as well. When taking in use a new technology, or changing an organization, it will obviously result a learning curve and delay of reaching

stable operation mode. Narrowing the initial performance gap between the efficiency of a completely new process and its expected efficiency requires lots of training and time. Many times continuous improvement techniques would generate results faster, and with a significantly lower cost.

Inevitably, processes will become outdated over time, and new technology development will bring better solutions available. Staying ahead, or even maintaining the same level with the competition will eventually require rethinking of the process in its entirety. A redesign is in any case very costly operation, in terms of both human capital and financial resources. Therefore, it is prudent to find as much information as possible about the current process refinement options, as well as potential and feasibility of the new options. (Schneiderman 2000.)

2.11.6 Step 6: Incremental Improvement

Continuous or incremental improvement is the cornerstone of any quality management system today. This has been the case since the early 19th century, when practice where workers were merely living robots and process development was carried out by development engineers, was gradually replaced by thinking that employees should be empowered to improve their own work.

This required training the employees to be able to use the basic statistical methods and start thinking more broadly about their part of the process. Some managers even went further. They trained employees to use scientific methodology and reserved 5 to 10 percent of their workday for improvement initiatives. (Schneiderman 2000.)

The main idea behind the continuous improvement is also known as the PDCA cycle illustrated in Figure 3.
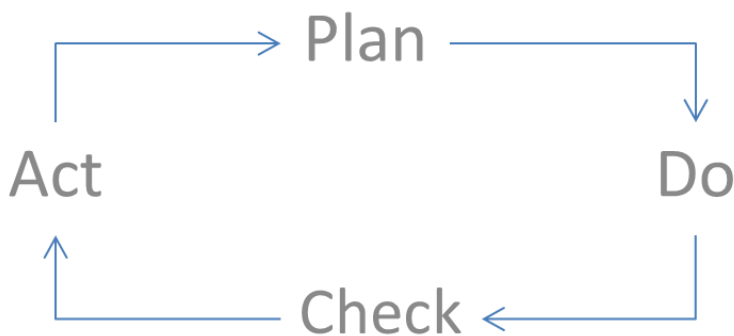
Figure 3. The PDCA cycle (Deming institute 2014)

- The cycle begins with the Plan step. The purpose of the change is first identified, theory of improvement method is formed, metrics to measure the effect of the change is designed and the implementation of the change is planned.
- In the Do step, the plan is implemented in practice and a controlled test is run for an intended period, to gather information how the change has modified the outcome.
- Next is Check step where the result of the change is evaluated. The evidence of progress, success and possible new issues that have arisen are monitored. The result of evaluation is used to decide if the change will be fully implemented.
- The last is the Act step, the integration of newly gathered information with existing understanding. This new knowledge can be used to implement the change, adjust targets, methods and find further improvement as the cycle continues to a new round with the next Plan step. (Deming institute 2014.)

These cycles are preformed again and again, forming a cycle of never ending continuous improvement. There is an excess amount of information available for the implementation of the PDCA cycle, especially in quality management literature.

2.11.7 Step 7: Redesign

A complete revamp of a process is the last option, only after it has become obvious that any other remedy is not sufficient to reach required targets. There are basically two categories of redesign, automation and outsourcing. The latter is considered when some part of the process is deemed inefficient because of lack of scale or that acquiring special competence and technology would be too costly. Automation is justifiable by cost savings alone, in practice replacing labor costs with capital costs of an investment. Technology can also be a product quality improvement opportunity, typically automation reduces human errors and that way can lead to better customer satisfaction and market position. (Schneiderman 2000.)

Redesign is also an opportunity to raise the ambition level of the process integration. Revolutionary changes can integrate processes not only within a company, but along the whole service chain, up to a rethinking of the business concept entirely. Revolutionary redesign requires abandoning of old methods and barriers, as well as being open to new collaboration and ideas. (Hannus 1994.)

3 RESULTS AND FINDINGS

3.1 Information Gathering

Interviews of several people were conducted to find information about working practices and interfaces existing in the organization. Employees were selected to interviews by either the quality manager of the company, or a team leader of a relevant team. Usually the people interviewed were the most experienced and most active individuals in their team.

The method of documenting business processes was formed and repeated for every process. In the first step the existing documentation was explored and a simplified draft of a process flow was designed as a baseline for discussion. A meeting was then scheduled to interview people familiar with the process. The first interview was divided roughly into four sections:

- Explaining the motivation of the documentation work to participants
- Gathering information of the roles and responsibilities of participants
- Forming an understanding of the process by discussion based on the draft
- Discussion about current process development practices, improvement ideas, management support and current general topics in the company

A more detailed process flow was then created based on understanding formed at the interview meeting. Additional information could be enquired in this phase from people who were found important for the process but not participating in the meeting. This usually consisted of people in other teams or customer side.

After the picture of the process was documented to the best of ability, a review meeting was convened to go through the whole process. At this phase many clarifications were acquired and sometimes more detailed descriptions were found necessary. Feedback was then used to correct and improve the documentation, and explanatory captions were added where deemed appropriate.

Usually two full meetings were enough to reach the required level of detail, but for large parts additional review rounds were held. Naturally smaller ad hoc discussions based clarifications were done, and hopefully refinement of the documentation will also continue in the future.

In some cases, one individual could be found who had a holistic view of the whole process, and documentation could be drafted after interviewing only one person. Drafted process descriptions were then reviewed separately with at least one other person in the team and modifications were made based on feedback. Usually the reviewer was working with some other customer than a primary interviewee, so the possible differences between customers could also be found.

3.2   Personnel Motivation to Documentation Work

An invitation to a process documentation meeting was surprisingly well received. Everyone invited to participate accepted, as well as agreed that new employee familiarization is currently difficult without a picture of the whole process. Although one person at first insisted that the management should be responsible for this type of project, she quickly became intrigued when explained the possibility to turn a specialist's knowledge into concrete actions. This supports the theory that people wish to take part in the development of their own work. Of course it has to be noted that the sample group is not representative of the whole workforce since participants were preselected by team leaders.

Two people even asked to have their parts implemented first, since they had an imminent need for process descriptions. One was about to arrange a process training for a customer, and the other had scheduled meeting with another customer to explain the process.

As most of the employees have come to the company by business transfer, there were different perceptions what would be required to create the documentation. A particularly good example of failure because of over documenting was demonstrated by former employees of a certain customer. As discussed in section 2.1, Multimäki (2003, 39-41) has noted that sometimes documentation can become the capital purpose of the organization. That had been the case, and a result was a process flow documentation that was extremely detailed, but could not be used since it was too big to be printed or shown with a projector. People who had participated in that project were very relieved to hear about the scope of documentation planned at this time.

The lack of working instructions was seen problematic in many teams, some even missed the old IT system that required lots of manual work, but at least had good instructions to do the work. Even though the understanding of the importance of such instructions is there, it does not seem to transfer very well to actions for creating it.

3.3   Encouraging Culture for Improvement

Based on principles described in section 2.10, personnel should be actively guided towards a company culture where improvement ideas are encouraged and employees feel empowered to influence their own work. While this is a continuing companywide transition, that is a responsibility of every manager and it will probably take a very long time to accomplish, process documentation meetings were relevant events to contribute to this target.

As most of employees have previously been part of a small, highly specialized department, or as described in Porter's model in section 1.10, of an infrastructure of a big organization, they have been used to having a team leader who is the most competent specialist in the field, and other management duties have been conducted elsewhere. That has led to a culture where a team leader is the one who designs the work and makes decisions independently. In the current organization, team leaders are first and foremost business managers who take care of customer negotiations and meetings, not so much technical accounting issues. Therefore specialists will have to assume more responsibility of the daily problems the teams may face in their work. Surely there are differences between teams, some leaders also have long experience of the subject, and some are more or less management professionals.

To contribute to the cultural change, the perception of current process improvement responsibility was introduced to the agenda of the meetings. Usually the subject was spontaneously brought up by the interviewee. While changing the mindset requires some explaining of the basic facts, a more effective way of persuasion is asking the right questions that pinpoint the need for new thinking. For example, questions that turned out to be effective for the purpose were:

- Who knows what the problematic parts of the process are?
- Who has the best understanding of the topic?
- Who knows all the people involved?
- Who would know a better way?

Even some tried, it proved to be very difficult for an experienced specialist to come up with an answer other than "I do" to these questions. Despite all encouragement, many people continue to need lots of support from management to actually start making changes in practice. The transition from an obedient subordinate to a self-reliant specialist does not happen very easily.

The difficultness of this transition became evident in the interviews. A quote from one individual who had one of the longest careers in the company describes it well:

"I had never ever in my career ordered even a pencil, and then I was asked to go and negotiate a consultancy contract with an IT system supplier!"

Most of the people felt that they would need more support from management; some were even upset that they had to make decisions by themselves. Considering these were the people who were most experienced and competent individuals in their teams, the result was somewhat surprising. There seemed to be a correlation between the phase of this transition in the team and the overall performance of the team. Correlation does not imply causality, but apparently there is still much work to be done to make every person feel comfortable taking responsibility on evaluating and developing their work.

A good sign of progress was the emerge of improvement billboards to the walls of offices. Lack of improvement subjects does not seem to be a problem as shown in Figure 4.

FIGURE 4. Improvement billboard

Now it remains to be seen, how well improvement ideas gathered to new billboards start moving towards the upper end. Although room for improvement exists in many places, it has to be noted that some teams already had impeccable development practices. The capability is in the organization, work in progress is to spread the best practices to other teams as well.

3.4 Process Analysis

Because a part of the assignment was to look for possible problem areas in processes during interviews and the documentation work, basic analysis of process validity was performed and findings were shared with the quality manager in periodic status meetings. Although this may contradict with the idea that employees should be the ones finding improvement objects, it is in line with the management's responsibility to gather information and plan for changes that are large or are affecting several teams, as discussed in section 2.9. The analysis was based on the information collected for the process documentation, and other discussions with both employees and management.

3.4.1 Invoice Processing and Purchase Ledger

When comparing the handling process of purchase invoices to advices found in the literature, the process seems to be very well developed, probably closest to the optimum efficiency of the processes analyzed in this work. Lahti & Salminen have listed the best practices in purchase invoice handling process in following way:

- Take in use electronic invoice handling and approval system
- Achieve invoices electronically
- Maximize share of e-invoices
- Automate account postings based on purchase contract, order or supplier.
- Approve invoices connected to purchase automatically
- Approve invoices connected to contract automatically
- Automate cost booking to periodic accounts directly from reception
- Reduce payments to one or two times a week
- Make a short list of accounts for the use of the purchase process
(Lahti & Salminen 2014).

Evaluating the process based on these items yields good results. The process is fully electronic within the company, except a part of achieving where an electronic system is still under development. Customers have been forcing their suppliers to stop sending paper invoices and move to e-invoicing, which has simplified the process since the phase where papers are scanned is not needed anymore. Scanning of the rest of the paper invoices is being outsourced to a specialist subcontractor.

Automation is used extensively, and more options for automation are searched constantly. Payments of invoices that match with purchase orders or contracts are approved automatically, many other invoices are moved automatically to the correct approver based on information found on the invoice. Also account posting information is automated whenever possible, as well as different rules for accounting period handling and cross checking the account information.

Despite the automation, there still remains manual work with invoices from occasional billers. It includes supplier information maintenance, finding the right approver for unclear invoices, and additionally checking the mistakes made earlier in the process.

By the definition made in section 2.11.2, the task is not adding value if it exists only to correct an upstream error and is a candidate for removal. Such task was found in the invoice handling process. However, more than 400 000 invoices go through the process yearly and there are hundreds of people involved in handling of those at the customer side, so it would be rather difficult to make the upstream process flawless. It had also been established that this is the phase where screening of the usual problems is most efficient, since all the invoices are collected in a centralized location, but not yet distributed to the separate records in the general ledger.

The work to fix the upstream problems is also underway; process quality metrics are collected and shared with people on the customer side. Training and support are offered to customers relating to best practices, and usage of automated processing is marketed. However, not all problems are related to lack of training or information. Apparently some people in the public sector, especially in Health and Social care, would be prone to value personal relations over monetary matters. For example, it has been told that some people happily approve invoices that would belong to someone else's cost center, only to be nice or to avoid being seen as a difficult person. While it surely is a nice thought, it will cause problems to the cost monitoring system.

3.4.2 Billing and Sales Ledger

The billing and sales ledger team is rather specialized in a part of the bigger process. Since every big customer has kept the billing part of the process in house, only the sales ledger and debt collection are outsourced. Therefore, most of the actual work focuses on keeping track of payments.

Billing service is offered to smaller customers, who typically have previously had a manual billing process, and are now having the benefit of moving to an electronic process. Since the whole billing service is quite new and only two people are actively working with it, a limited amount of investment is put into it. For that reason the process is not very efficient and there are many technical problems with the IT system. The most obvious inefficiency was found in the phase where billing information was transferred to a subcontractor responsible for mailing the bills. Usually the information exchange between different IT systems is automatic, there was a manual step where the IT department had to compress and copy one file to another location. Then a follow-up had to be arranged, to make sure the file was actually sent to the subcontractor.

In addition, the process is filled with extra checks and follow-up tasks. The reason for the situation seems to be both vagueness of customer responsibilities and lack of trust in the IT systems. The process is also new to customers, so mistakes inevitably happen and they have to be sorted out in the earliest phase possible in the process.

The mitigation for inefficiencies in the process would be divided into two parts, collaboration with stakeholders such as customers and subcontractors, and IT systems development. For improving the whole process, focus to open and structured collaboration would be needed to find root causes of problems found in quality assurance steps and actions to correct those. The goal should be to reduce the need for extra checking points, and finally agree on responsibilities of quality assurance.

The IT system had been taken in use earlier this year and it does suffer from startup difficulties. The same system is used in several functions, and prioritization to most important problems has left less business critical processes underdeveloped. Similar to resource sharing issue discussed in 2.3.1, every function should get a fair chance of using the resource, where the resource in this case is an IT developer. Moreover, the problem mentioned earlier, where the IT department has to do manual work several

times a week because there has not been time to implement automation, is a perfect example of a resource allocation issue.

The bigger part of the work is the follow-up of payments. Automation plays a big part in this task, the vast majority of bills includes a reference number which is then used in payment. That way bills and payments are matched automatically and moved to bookkeeping records. Only unclear payments have to be sorted out manually. Even though the share of unclear ones is small, the number of bills processed makes the amount of work significant. More than half a million payments of bills in a year include naturally many human mistakes.

IT systems are also causing difficulties in this part of the process, maybe not so much in missing functionality, but there seems to be some ambiguity how the system should be used, and what kind of options the system could offer to improve efficiency. There could be use for extra training or system consultancy, but people are so busy catching up backlog of unfinished tasks, that it would be hard to find the right time for it.

The problem in evaluating this part of the process is that the work is organized in a way where every person is responsible for a certain customer, and handling almost every task in the sub process for that one customer. Therefore, people may have different ways of working; even the order of independent tasks may be different. Since there are many people executing the same process in parallel and independently, it would be difficult to agree on a common process flow.

It would be recommended to first organize resources more effectively, for example, making people responsible for a certain task, rather than certain customer. It was also agreed in an interview that this would be a more efficient way of working, and had been already proposed earlier by one interviewee. The only doubt was that it could make the work less versatile. After responsibilities for tasks would be nominated, people could start developing their own task further. As the ownership of the task becomes more apparent, employees would better perceive the authorization for development.

3.4.3 Travel and expense claims

The claims handling process is a special case, because most of the tasks happen at the customer side, and the claims handling team is merely controlling the process and tools. This includes maintenance of customer information, the execution of payments and accounting record transactions, and technical support for customers. For the time being, the need for a travel process description was related to customer trainings only. As the usual policy with most customers is that every employee who travels must use the tool to create a travel claim, there are quite many people who need training. Even though detailed instruction documents and internal training are enough for most of the end-users, the support people in every organization have to be trained more deeply. As the end-user process is quite straightforward and mandated by the tool, development options relate to allocation of responsibilities between a traveler and support personnel.

The usual challenge with a travel claims process is that people who travel and know their costs, have difficulties allocating those costs to the accounting system in the correct way. Discussion with the travel process owner of one customer revealed that before the electronic claim handling system was deployed, people in the financial department were responsible for adding accounting information to travel costs. Surely the process based on circulating paper claims and receipts was inefficient, but the difficult part of the process was done by people most capable of doing it.

As the electronic system was taken into use, claim preparations became a self-service. Apparently it is not uncommon to expect cost savings by moving tasks thought to be simple from specialist to other employees, but this easily causes expenses in a later phase of the process. With new responsibilities, people who were travelling faced questions such as is the relevant organization allowed to deduct a value added tax included in the cost or not. It cannot be expected that an ordinary employee would know the taxation rules, or cost accounting rules for the organization. Due to this conflict in expectations, claims had many errors and people responsible of cost accounts had not been allocated enough resources to sort them out. This situation had led to an outcome where a backlog of several years of unsorted accounts had been built up.

A more efficient way of dividing tasks between traveler and financial department would be that travelers would be responsible for providing all the information related to generation of costs, including scanned receipts, and then financial specialists would add

the accounting information. Also, there would have to be a more inclusive service for people who travel maybe only once in a year, since it does not make sense to use time for learning how to use the claim system for making only one claim in a year.

Some customers already do have such a procedure. It seems to be understood that, for example, doctors in hospitals can spend their time more usefully by receiving patients than making travel claims, so an assistant familiar with the travel process makes the claim for them. Somehow this logic is not applied in many other organizations.

The other challenge, mentioned by a person responsible for the travel account of a certain customer, was how to make people finish their claims process in the first place. In their policy, all the costs were directly billed from the organization and the traveler did not actually claim anything afterwards. Therefore, there was no personal benefit in finishing the last steps of the process, so they left their claims unfinished. Apparently the worst situation in that sense was with school principals, since they are used to be the authority in their own organization, and there is practically no one who could order them to do anything. So it was told that they bluntly refused to finish their claims.

One way to mitigate this kind of a situation is presented by Lahti & Salminen (2014.). Employees would have company credit cards; but employees would be personally responsible for paying the credit card bill. Since the credit cards are connected to the company, information about purchases could be received from a bank electronically to the travel claim handling system. Given that the claims process is sufficiently efficient, a traveler would have time to finish the process and get a reimbursement before the credit card bill has to be paid. This would not cause an extra burden to the traveler, but would incentivize quick handling of the claim.

3.4.4 Payroll administration

The payroll is the most labor intensive process studied in this work. The main part of the process is automated, including calculation and payment of wages, taxes and insurances. However, the customer base is diverse and there are many sizes of customers, having around twenty different collective labor contracts, in addition to local contracts which may include exceptions to collective contracts. Also, some people may work part time under two or more contracts, which makes salary calculation quite

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complex. The payroll management tool can barely support this complexity, and manual calculation of the most difficult cases is needed.

There are basically two large parts in the process as shown in Figure 5. The parts are very different in nature. The payment process is automated and the focus is on quality control and approval of the payments, salary information gathering is a more manual saving of information, from paper copies and emails, to the payroll system. Many customers have adopted electronic information transfer, but usually there are still exceptions that the system cannot handle and those are received by email or paper.
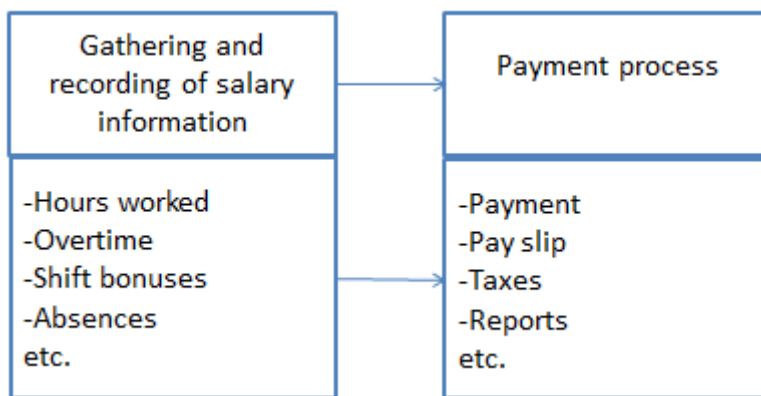

FIGURE 5. Main parts of the payroll process

The work done in the payroll teams seems to be quite fragmented, as there are lots of small tasks that are not directly linked together, but are necessary for the whole process. The main payment process is not very complicated and is already quite optimized. That is why usual methods for process development, for example the 7-steps -method described in section 2.11, are probably not very effective when applied to the whole process. More useful approach would be to apply the method to sub processes independently. Since the sub processes are independent for the most part, there is a very limited risk of suboptimization.

Most of the short term development options are related to the increase of automation in information transfer and saving. Some customers are already conducting evaluations and deployments of new time tracking systems, which will help automate the process. The bulk of the development work has to be done at the customer side, but many times there is also an option to start using the existing systems provided by Monetra.

When information has to be manually saved to the system, according to Lahti & Salminen (2014.), it is done most efficiently by the person that generates the information, or at least in the earliest phase of the process possible. While the deployment of new systems where employees can record their hours directly accomplishes this goal for regular workers, there are still many exception cases. Especially in the public sector, there are many people who are not actually employees by contract, but are paid some form of compensation via the payroll process. This includes for example private caregivers in the social sector and political members in different boards.

Some form of internet-based system could be developed to handle these cases, but apparently there are no off the self –type of solution available that would be fit for the purpose. A redesign of this sub process and development of such system would probably become topical after acquiring more public sector customers and the amount of special payments increases.

For the time being, incremental improvement would be focused on removing duplicate saving tasks. Now there are cases where an end-user reports the work done, one or more assistants at the customer side save the information for their own records and send a copy of the information to payroll, where it is saved in another system. In many cases customers have a possibility to save the information directly to the payroll system, but it is not always done since the responsibilities are not clear.

One example emerged coincidentally when a spontaneous complaint from a representative of one customer was received personally. Apparently the people at the customer side, who were responsible for entering compensation information to the payroll system, felt that they were doing a task that belonged to Monetra. They had an impression that someone at Monetra had "asked" them to do it because she was too busy. Evidently this is a problem with customer communication, since the responsibility for the task is defined in a responsibility matrix which is a part of a contract document.

The quality of information saved is another challenge. Since a lot of information is saved manually also at the customer side, there also has to be quality control. When the quality assurance is moved to a different organization, the control may become more difficult. According to the quality manager of the company, one way to mitigate the problem had been the use of pricing as a motivation for quality improvement. While it

may be intuitive at first sight to charge the customer for making extra checks, this could easily lead to inefficient process. When certain payment data was checked by Monetra at a separate cost, people at the customer side became careless about the mistakes in the material, since they thought that if there were any errors, someone would inform them. Pricing was decided to be changed in a way where the checking became a part of the base price, but extra charge was made for every mistake found. That way the customer was incentivized to pay attention to errors in the data, since they could save money by producing error free material. If and when the amount of errors reaches to the zero level permanently, the checking phase can be abolished completely and the base price decreased accordingly.

3.5   Management system

Since the people at Monetra are specialists in their field, ideas for process development have to originate from inside of the team. However, management has to be active in collecting these ideas and has to enable the evaluation and implementation of them. Many best practices have already been started; the next step would be to formalize the system.

At Monetra, management topics are divided into two executive meetings, a strategy meeting where long term topics are addressed, and an operational meeting where matters of daily business are resolved. That way management's time for long term development actions cannot be overtaken by more urgent topics. As the company is growing rapidly, many development programs relating to new businesses and tools are ongoing and require lots of attention and effort from the upper management. A larger group of people are participating in the operational meeting, where daily concerns of business processes are addressed. As daily topics are usually more acute problems in a process, either in Monetra's or in the customer's part of it, the meeting could be categorized as a process quality work. The process improvement type of cases are covered in a team leader meeting, where best practices are shared between teams and new actions are planned.

The company has many individual process-quality related functions and actions, but there are quite big differences between different teams in the implementation. It would

be recommended to centralize the management of these functions and build an actual quality management system. There are many well thought and documented systems, such as ISO 9000, which could be taken as a baseline and implement it in suitable parts. That would help standardizing the quality actions in different teams, and most importantly would urge the comparison of current quality and improvement methods to the best practices that are in widespread use among competitors.

As discussed in section 2.8, process development is the central part of quality management and should be tightly connected together. The benefit of having a quality management system such as ISO 9000 is that it requires management for every aspect of the company that has an effect on quality. Moreover, it forces the focus on prevention of quality problems from occurring, rather than reacting to incidents.

4 CONCLUTIONS AND DISCUSSION

4.1 Review of Topic

The initial assignment was to document the current business processes of the assigner company, and help analyzing them in order to find obvious improvement targets. The topic was expanded by the author to a study of current process management methods and personnel involvement in an improvement.

The documentation was created for four sub processes of accounting; Sales ledger, Purchase Ledger, Payroll and Travel claims management. The level of detail was deemed sufficient when a process description did not overlap with a working instruction, or it was seen more useful to fill the gap between by expanding the instruction documentation. The purpose and benefits of the documentation discussed in the sections 2.1 and 2.2 were used as a guideline of what should be documented and how. The opinion of the specialists interviewed was in a major role in this regard, although sometimes some balancing had to be done to keep the interviews on the right track.

An analysis of the processes documented was conducted, and the found improvement targets were reported to the quality manager. Most of the problems found were already known and many were quite complex and not appropriate to publish, so only examples of those are written out in this thesis.

The management system was reviewed and interest of personnel in development was studied in the specialist interviews. The company was found to be missing a proper quality management system, although many individual improvement and quality measurement actions were ongoing. It has to be noted that at least one big customer was praising the quality monitoring actions, so at least some properties already exceeded customer expectations. Very few specialists felt empowered to take action for improving their work. Some contribution to changing this situation was made by initiating a discussion about the role of a specialist in the development, and at the same time gathering of improvement ideas had been made visible also in remaining of the teams.

During the literature review it was found that the recommended way of process modeling was to initiate the study by looking at the process from the point of view of a customer. This was found difficult since the work had been divided into two theses, where the parts that form the beginning of the customer process were done first, and the other one was planned to be done later to cover the latter parts. This caused a situation where both developers were lacking the overall picture, thus effectively preventing ideas for improvement of the whole customer process. Practical benefit would easily be limited to individual tasks or sub processes within an organizational unit.

4.2   Further Study

The second thesis is already planned and support will be given in familiarization of the new thesis worker. In addition to documenting and analyzing the remainder of the processes, it would be advisable to try to collect all individual processes and modify them to form a proper description of customer processes. Also, special attention could be paid to the interfaces between different teams.

Other possible subjects for additional thesis assignments would be to take an end-user perspective of the service, and form a service blueprint description. A service blueprinting is a method of defining what the customer actions within a process are, what customer service actions are, what happens in the background of the service and what support actions are necessary for the service process.

IT systems could be analyzed and documented. There are surprisingly many different IT systems that are interacting with each other, and a big number of interfaces is used in this interaction. The work would have to be done in cooperation with the organization providing the IT support and services, since the information about quite many business critical systems seemed to be located only in there.

The Association of Finnish Local and Regional Authorities recommend a use of the EFQM, European Foundation for Quality Management model for the quality management assessment in public organizations. A self-evaluation is a big part of the model; the evaluation work could be done as a thesis, especially by a management student. Also, implementations of the whole ISO 9000 up to the certification requirement level have been done as a thesis assignment in other organizations.

4.3 End notes

It has been rewarding to see that there are surprisingly many analogies found on the service type of business, with for example manufacturing. Financial systems are nowadays in large part automated, and the role of the service provider is to control the quality and fix the problems. This is highly analogous to electronics production where an automated production line is responsible for large part of production, untouched by personnel. Only the items which fail in quality control are directed to hand processing. In financial services, large parts of book entries go smoothly through an automated process to general ledger and are closed. Only the ones that contain insufficient information are directed to hand processing

It could be seen that the future accounting work would start to resemble heavy processing industry, in a sense that the machine will be doing the producing, and people around it are taking care of the machine. Automation is already at the level where development starts to enter the phase where artificial intelligence comes into play. Some early versions of intelligent account reconciliation systems seem to be available already, and it is only a matter of time when the use of such systems becomes common.

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ESSENTIAL TERMS

Accounting

A system for following and reporting the results of an organization's economic activities

Accounts audit

An objective independent examination of the financial statements of a legal entity.

Balance Sheet

A summary of the financial balances of a legal entity. The balances consist of assets, liabilities and ownership equity.

Sales Ledger

Also known as Accounts Receivable. List of financial transactions customers are required to do or have done. Includes sent invoices, payments, debt collections and credit losses.

Purchase Ledger

Also known as Accounts Payable. List of financial transactions a company is obligated to do or have done. Includes received invoices, payments that are made.

Posting

An operation where accounting information, for example a cost center, is connected to the invoice

Reconciliation

A procedure to assess whether a balance of an account is correct.

Process

Series of logically connected tasks aiming to produce a specific service or product