Process analysis made easy

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by
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'How to gain quickly and easily insight into business processes without the use of a business analyst'

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I. Abstract

Research was done to asses if proper process analysis in organizations can be performed by an end user rather than a scarce Business Analyst (BA). An end user is an employee, who is inexperienced in the field of business analysis and has a limited technical knowledge, but is familiar with the business process. Next, an end user is always available, which is an advantage over the scarce BA. A method was designed to let an end user perform process analysis. This method was based on interviews with 5 BA's in the field of data-driven process analysis and implemented in MagnaView, a data-analysis tool. The overall goal was to enable an end user in performing process analysis in order to make a BA redundant for gaining insight into business processes, which was partly realized. The validation was done through user tests which were positive.

II. Management Summary

This study investigates the applicability of data-driven process analysis in organizations. The aim is to clarify the possibilities of process analysis and to investigate the possibility of conducting a process analysis by an employee, who is inexperienced in the field of business analysis, but is familiar with the business process. This research was performed in cooperation with Eindhoven University of Technology (TU/e) and MagnaView B.V., a software company specialized in visual analytics.

Problem

There is a growing demand in many companies to quickly and easily gain insight into their business processes. Usually the insight is obtained by a Business Analyst (BA), who is experienced and has an extensive knowledge in the area of Business Analysis. The BA is scarce, but clearly has great benefits for the company. The benefits arise from gaining insight into business processes through process analysis.

In this master thesis, research has been done to fulfil the demand for (partly) replacing the BA. Providing an intelligent tool, which makes it possible for organizations to perform data-driven process analysis, without the use of a Business Analyst (BA), would be a suitable solution for the scarce BA. Semi-automated software tools already exist in other disciplines, such as HRM, CRM, Finance, etc. But a simple tool to perform process analysis, without the use of a BA, is not yet on the market.

According to MagnaView, the shortage of BA's leads to a limited usability of process analysis in organizations. MagnaView wants to obtain a process analysis tool which applies (semi-)automated process analysis. The tool will be based on results of this research project and will be named MagnaView PAS (Process Analysis Suite). The knowledge and experience of a BA will be incorporated in PAS and therefore the end user of PAS does not need to possess that industrial engineering knowledge or experience. By means of PAS the end user should be able to perform process analysis, and achieve the same results as an experienced BA with his own toolbox.

From this problem context the main research question for this research project is stated as the problem statement:

How can the experience of a business analyst be incorporated in MagnaView PAS in such a way that an end user (non-BA) quickly and easily gains insight into business processes?

Research Method

Information was gathered from experts in the process analysis area through interviews. The results of the interviews were supported by scientific literature in order to support the reliability of this research project. The key elements of the BA's method were determined through the interviews and the process analysis method for the end user was designed based on the key elements. This method was incorporated into MagnaView PAS and validated by user tests. This research project was applied in healthcare context, actually it is a generic method which can also be applied in other industries.

Results

The results of the interviews revealed several core aspects of the BA's process analysis method. These aspects were:

- Problem identification
- Organization
- Transformation of data
- Patterns
- Employees
- Financial
- Performance indicators
- Remarkable situations
- Time
- Efficiency and effectiveness
- Presentation.

Not all of the aspects are important for ach business process. A selection and sequence of the aspects is depending on the business process.

With these results the method of a BA was determined and visualized in a flowchart. In order to make the method more transparent it was decided to subdivide the method of the end user into four phases. Basically the BA spends a great deal of time to become acquainted with the business process, which is the first phase. The other three phases are: discovery, aspect analysis and presentation.

The experience of the BA helps him to analyze a business process quickly. The focus on the correct aspects is the core part of the BA's process analysis method, which is the third phase 'aspect analysis'. The importance of the different aspects depends on the type of industry, hence it was decided to make MagnaView PAS industry specific.

The key elements of the BA's method are fundamental for designing a process analysis method for end users. Other factors that have to be considered while designing the process analysis method of the end user are:

- The ability of the end user
- The MagnaView tool
- Guidance of the end user

Guidance is not a factor in the method of the BA, because the BA handles guidance intuitively, hence the BA knows exactly which steps to apply during process analysis. The end user is not able to structure this automatically by himself. The limited ability of the end user in combination with the guidance through the process analysis method leads to the navigation part. Navigation is therefore an important factor for success. This factor has been extensively discussed and incorporated in MagnaView PAS during this project.

The BA's method was based on interviews with 5 BA's in the field of data-driven process analysis. All of the 5 BA's are educated at the TU/e, which lowers the reliability. To deal with this limited reliability, the method was reviewed also positively by an expert who studied at the Neyenrode Universiteit.

User tests were used to validate the navigation factor of the tool, which resulted in a positive assessment. No employees of the GGzE were available for this user test, so no real end users were used. Instead individuals, who are also familiar with the process and could be considered as 'end users', validated the tool.

Conclusion

In a final reflection on the total research project, the solution to the problem statement is discussed, just as the limitation and reliability of the project. This study investigates the applicability of data-driven process analysis in organizations and it can be concluded that the applicability of process analysis can be enhanced, due to the use of Magnaview PAS. Hence MagnaView PAS enables an end user to perform process analysis, which makes a BA partly redundant and solves the problem statement to a large extent.

To enable the end user to perform process analysis, the tool must suit the method of the end user. Therefore, actually, two factors are important to be incorporated. First, the aspects which were revealed in the interviews and secondly, the navigation for the end user.

The combination of those two factors is required to perform process analysis successfully. A single core aspect is required to come up with a part of the results. But a correct selection and sequence of the aspects is required as well in order to combine the sub results into the desired overall results. The aspects can be seen as individual soccer players, the correct choice of individual players in combination with the correct position makes a great team. So the correct set of aspects in combination with the correct sequence of aspects makes process analysis successful. The navigation is required to guide the end user through his method of process analysis. In order to build in the navigation, the key elements of the end user's method need to be structured. Structuring is possible by subdividing the method of the end user in different phases, this way the method became more transparent for the end user.

Limitation

Limitations of the project are mainly due to the demarcations made during the project.

- The tool will be industry specific and not completely generic. The case study during this project was applied with a GGzE dataset from the healthcare industry.
- The incorporation of the end user's method into MagnaView PAS is done for the navigation factor. The method is therefore incorporated as a whole, but not into detail.
- The transformation aspect of the BA's method is left out. This aspect is also known as the Extract, Transformation and Load (ETL) step in the Business Intelligence area. This aspect is too complex for this project and therefore it is assumed that the data quality is sufficient.

- One of the core aspects of the BA's method is setting the correct KPI's. This has to be done once for every industry, but also in the method for the end user the BA has to set the KPI's. The end user is simply not able to set the correct KPI's, because his technical knowledge is too limited.

A limitation based on the research method was the experience with MagnaView, in advance, linked with time available. It took me a valuable time (experience) to understand a certain level of the MagnaView tool. This experience level is needed to incorporate the end user's method into MagnaView pas smoothly. Extra resources could have been a solution to this limitation.

In general the first (beta) version of MagnaView PAS is designed and could be extended on several points, but the foundation is strong and ready for development, given the results of the user tests.

III.Preface

This report describes the master thesis project, which was performed for the Eindhoven University of Technology (TU/e) in order to graduate for the master Operations Management and Logistics (OML). The project is quite extensive and needed to be accomplished individually; however it would not have been possible without the cooperation between MagnaView and TU/e and their support and effort into this project.

Therefore, I would like to thank my first supervisor Rik Eshuis for providing useful information, thoughts and feedback with respect to my work and this final Master Thesis report. Without his supervision, this project and report would not have been accomplished the way it currently has. Furthermore, I would like to thank my second supervisor Ton Weijters. His extensive experience in this area has contributed to valuable advice throughout the project.

Next, I would like to thank the employees of MagnaView BV. They are all very interested in the project and were always there for me. Special thanks go to my supervisor from MagnaView BV: Patrick Riemers. Patrick has done a great job as supervisor, he helped me with making the right decisions. Above all it was fun to work with Patrick.

Then I would like to thank my family, who supported me during my whole life and also during this master thesis project. Dad, thanks for all your life lessons and cleaning my bike every weekend. Mom, thanks for your good care during the weekends. Niek, thanks for managing my sport activities and your enthusiasm. Stef, thanks for your social support and (bad) jokes. I also would like to thank my girlfriend Ingrid for her good care. Now that we live together we should be able to spend more time together, but that has not yet happened, as I have spent more nights working on my laptop than spending my time with her. Thanks for your patience and support.

And last but not least, I would like to thank Henk Willems for his support during the writing of this report.

Ronnie van der Wijst

Eindhoven, 2011

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1. Introduction

This study investigates the applicability of process analysis. The aim is to clarify the possibilities of process analysis and to investigate the possibility of conducting a process analysis by an employee, who is inexperienced in the field of business analysis, but is familiar with the business process. This research is performed in cooperation with MagnaView B.V.[1], a software company that will be introduced in the next paragraph. This chapter also contains the context and statement of the problem. Subsequently, the research questions and accompanying method will be explained. Finally the outline of the remainder of the report will be stated.

1.1 Problem context

The problem context discusses the background of the project and gives a brief description of the company in question. Based on this section, the problem will be stated in the subsequent paragraph.

MagnaView

MagnaView is a software company in the field of Business Intelligence, Visual Analytics and Management Reporting. Erik-Jan van der Linden (MA, PhD) and Professor Jack (Jarke J.) van Wijk (MSc, PhD) started the company in 2003. Since 2005, MagnaView has offered its software and services to customers in six countries, namely:

- The Netherlands
- Italy
- Australia
- United States of America
- Germany
- Spain

This software helps the customers to obtain more impact from their datasets. MagnaView is also the name of their main software tool, which can be used in any sector. Besides this general software, MagnaView offers other products for use with specific information systems. These specific solutions make MagnaView adaptable for certain sectors. The specific solutions of MagnaView are listed below.

- *Cum Laude* is applied at secondary schools in the Netherlands that use the SOM[2] School information system. MagnaView Cum Laude allows interactive exploration and analysis of hundreds of thousands of records with grades, absences, teacher and student information.
- *Pathos* is MagnaView's solution for the pathology area. Every pathology lab in the Netherlands is able to use Pathos, because they all use the same information system.

[1] For more information about MagnaView B.V., see http://www.MagnaView.com

[2] For more information about SOM, see http://www.simac.com/nl/onderwijs

- *MicroLab* is a solution that can be used in combination with Philips Medical Systems' Micros[3] solution for microbiological laboratories. MicroLab gives insight in changes in resistance of specific 'bugs' for specific 'drugs'.
- *PAS*, the Process Analysis Suite, is a new solution of MagnaView. This solution is process-oriented, which distinguishes it from the other solutions.

The main competitors of MagnaView are Tableau[4] and Qlikview[5]. Both are American companies which originally focused on the American market. Currently Qlikview and Tableau also focus on the European market, which makes them real competitors for MagnaView. Tableau and Qlikview are not focused on process-oriented data.

The income of MagnaView is generated from software licences, projects based on subsequent calculation and a small amount of subsidy. The goal for the future is to make their software licences the main source of income. Currently this is around 40% and the target in an ideal situation is 80%. Probably the number of employees will grow over the years. The current number of employees is around 15, consisting of part-time and full-time jobs.

Project background

Recent Gartner studies (e.g. (Gartner, 2010)) identify the corporate management of business process improvement as the number one business and technology priority of CIO's in 2010. Organizations typically use Business Process Management (BPM) as a set of structured methods and technologies to better manage their core business processes. As a result, BPM has become a powerful competitive tool for organizations (Bandara et al., 2009). As organizations become more process oriented and BPM tools and techniques continue to evolve, the need for BPM expertise increases. The different roles of process owners, process analysts and managers of BPM centres of excellence are just some of the positions for which specialized BPM skills are required (Bandara, et al., 2009). Hass (2008) argues that the skills of a Business Analyst (BA) are emerging as a valued business competency. In practice, business analysis is an essential component of project success, regardless of whether technology is involved or not (K.B. Hass, R.V. Horst, K. Ziemski, 2008). And at the same time, BPM skills are also highly emphasized for organizational success (A. Alibabaei, W. Bandara, M. Aghdasi, 2009) (Y.L. Antonucci, R.J. Goeke, 2010). The remainder of this research will focus on process analysis skills of a BA, which is fundamental for business improvement. The process analyst is a specialized type of BA who is process-oriented.

Process Analysis

Process analysis is performed in order to identify problems and is mainly based on information from people through interviews, observations or documents. The disadvantage of this approach is that people

[3] For more information about Philips Medical Systems, see http://www.healthare.philips.com

[4] For more information about Tableau, see http://www.tableausoftware.com

[5] For more information about Qlikview, see http://www.qlikview.com

do not only talk about facts, but also about their views. During interviews they will also defend their own political interests; they might be after another position in that company. This form of information gathering, dominates the qualitative form over the quantitative form. Qualitative data describes items in terms of quality and is the opposite of quantitative data. Quantitative data defines output on a numerical scale. Numerical data can be analyzed using statistical methods, and can be visualized using tables, charts, histograms and graphs. Visualization of numerical data is the strength of MagnaView.

Quantizing refers to a process by which qualitative data are treated with quantitative techniques to transform into quantitative data. The researcher must convert verbal data into items, constructs or variables that are intended to mean only one thing and that can, therefore, be represented numerically. (Sandelowski, 2000)

Data-driven approach

Besides interviewing or observing individuals a minority of process analysis is data-driven. Data-driven means that the information is not gathered from people, but from information systems (IS). These information systems support both primary and secondary processes. A significant amount of data is stored concerning these processes. This data-driven approach of process analysis shows how the process actually takes place. It gives an idea of how activities, employees, machines, etc. are connected and how products or information flows from one to another. Normally the quantitative data dominates during data-driven analysis, but qualitative data is normally also included. This approach emphasizes processes and connections. One method of how this information can be used is process mining. Process mining uses process data (event data) to mine process models and gaining insight into the current processes. Through the increasing number of information systems, the data-driven approach of process analysis is also increasing. This report covers the data-driven approach of process analysis.

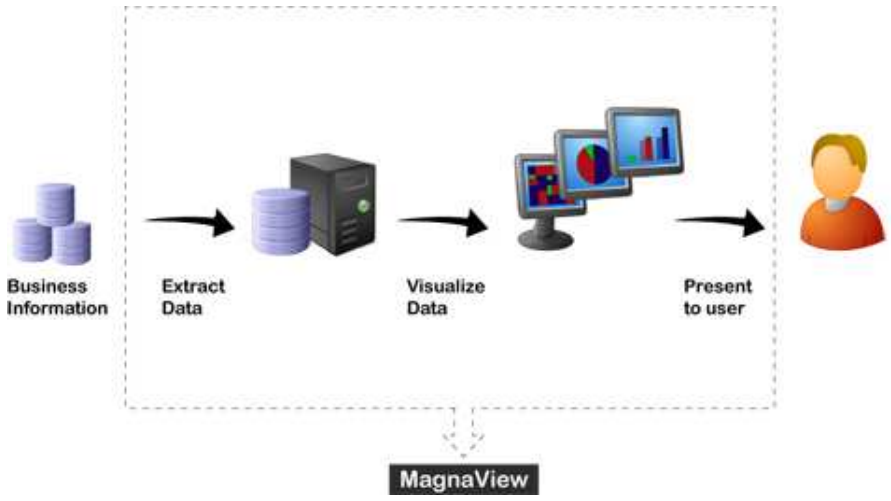

Figure 1-1 MagnaView as a data analysis tool

The objectivity of data from information systems is an advantage, but in general the amount of this data is enormous which makes it a problem of current interest. This enormous amount of data creates

complexity. The complexity makes it difficult to analyze and therefore a data analysis software tool is indispensable. A number of tools are available, such as Qlikview, Tableau, MagnaView and Cognos. All these tools focus solely on enabling data analysis. The data is not always easy to analyze and not always objective, because of noise in the dataset. In practice, often the data needs to be pre-processed, because of accuracy and conformance of the dataset.

A BA normally has his own toolbox and the associated knowledge to work with it. Figure 1-2 attempts to reproduce the functionality of the BA. In short, the BA transfers information, through his knowledge and tools, into desired business improvements. The available (information) input is visualized in the funnel in Figure 1-2.

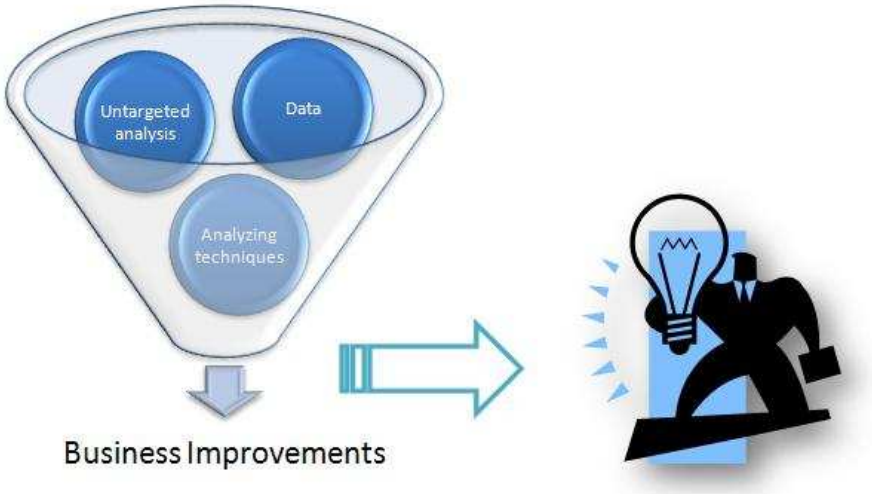

Figure 1-2 The data-driven approach of a Business Analyst

Now, MagnaView aims to gain insight in business performances through semi-automated process analysis. Process analysis is an approach that helps BA's to improve the performance of their business activities. Thus process analysis is a form of business analysis. By semi-automating process analysis, less input of the end user is required. The input of the BA is required to make the right decisions during the analysis phase. Hence the BA needs to have knowledge of/experience in industrial engineering to be able to decide which steps to perform. The demand for knowledge/experience will be reduced by semi-automating the process analysis. And therefore MagnaView PAS enables organizations to analyze business processes without the use of a BA. Process mining can be done partly automatically, but is not part of MagnaView PAS. MagnaView PAS distinguishes itself by enabling process analysis through visualization and providing a high level of usability. Fully automated process analysis is a step too far, but would be a great solution for the future. Watson[6] of IBM aims to achieve full automated thinking/decision making and handling, but is not active as a BA.

[6] For more information about Watson, see http://www.ibm.com/innovation/us/watson/index.html

An Ishikawa diagram is used to generate an overview of the several causes which lead to the problem of this project, see Figure 1-3. This diagram is produced in collaboration with MagnaView. To perform process analysis, first of all a business process is needed to analyze. Secondly a person is needed, who performs the analysis and in order to deal with the data a software tool is required, as is mentioned before. The person will be a BA, since he is the only individual with the required experience and knowledge to perform process analysis. According to MagnaView the BA is scarce and for that reason the applicability of process analysis in organizations is limited. Data-driven process analysis offer opportunities for improving the analyzing techniques, in order to enhance the applicability of process analysis in organizations. The experience of the BA needs to be copied to a process analysis software tool. The software tool, which will be MagnaView, will become an intelligent tool. This new tool of MagnaView will be named MagnaView PAS and will enable employees (non-BA's) of an organization to perform data-driven process analysis. This employee is familiar (domain knowledge) with the business process, but has no experience in or knowledge of industrial engineering. Through the use of MagnaView PAS the BA will be redundant and the application of process analysis will be less limited.

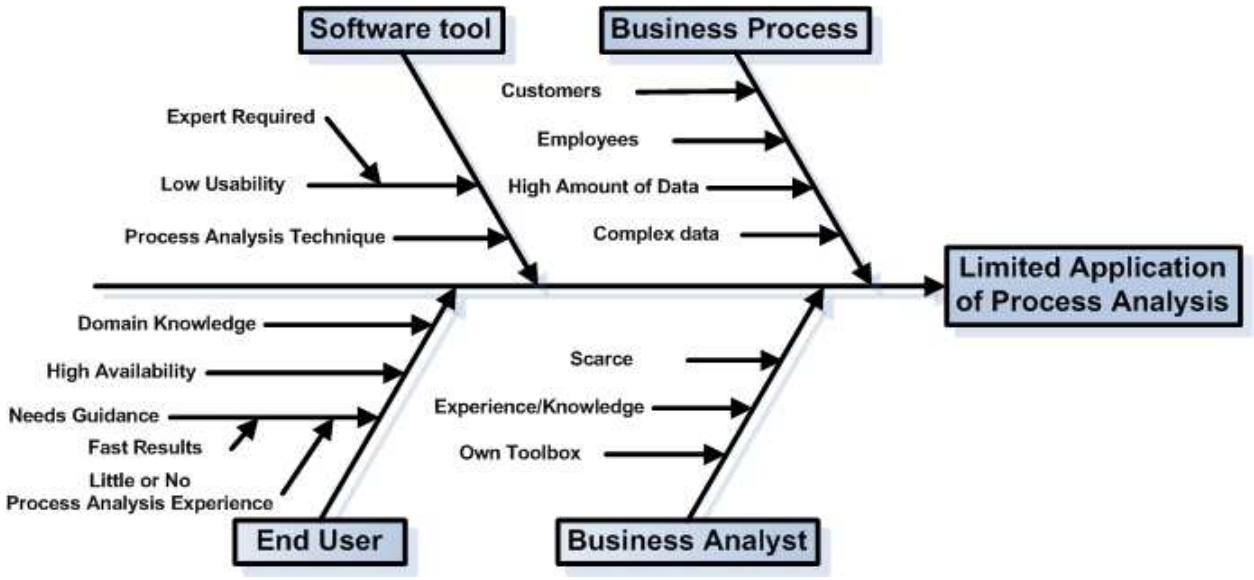

Figure 1-3 Ishikawa diagram

There is a growing demand in many companies to gain quickly and easily insight into their business processes. Providing an intelligent tool, that makes it possible for those companies to perform process analysis, without the disposition of a BA, would be a suitable solution for the limited application of process analysis. Automated software tools already exist in other disciplines, such as HRM, CRM, Finance, etc. But a simple tool to perform process analysis, without the use of a BA, is not yet on the market.

1.2 Problem statement

This paragraph will define the problem of this research project based on the context of the preceding paragraphs. The preceding paragraph mentioned that the data-driven approach of process analysis will

be used in this project. It also mentioned that organizations aim to perform process analysis in order to gain quickly and easily insight into their business processes. The implementation of possible business improvements are out of the scope.

According to MagnaView the limited usability of process analysis is due to the shortage of BA's. MagnaView seeks to apply semi-automated process analysis. The knowledge and experience of a BA will be incorporated in PAS and therefore the end user (non-BA) should be able to perform process analysis, and achieve the same results as an experienced BA with his own toolbox. The end user will be an employee from an organization, hence he or she is familiar with the business process, but has a limited knowledge of industrial engineering. With the new version of MagnaView PAS, a wide range of potential end users is generated. The problem statement (main research question) of this project will be:

How can the experience of a business analyst be incorporated in MagnaView PAS in such a way that an end user (non-BA) quickly and easily gains insight into business processes?

If the end user (non-business analyst) is able to quickly and easily gain insight into business processes by using MagnaView PAS, this will mean that the required experience or knowledge is part of MagnaView PAS.

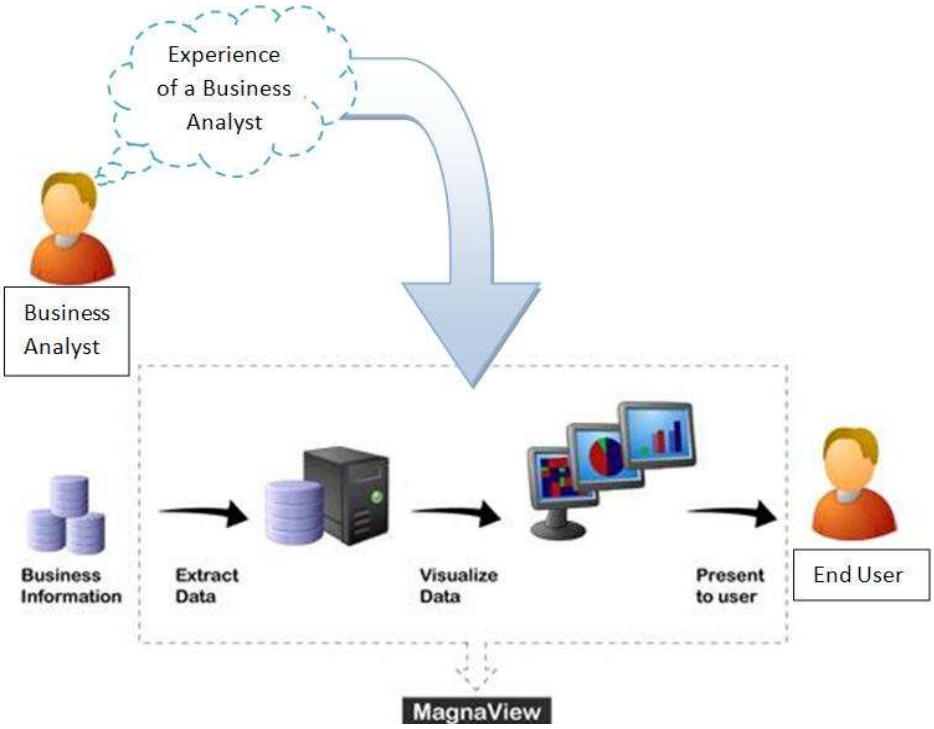

Figure 1-4 The transfer of experience

1.3 Research Questions

Derived from the problem statement, as mentioned in the preceding paragraph, concrete research questions are stated in accordance with MagnaView B.V. The answers to the research questions (RQ's) will lead to a satisfactory solution of the problem statement.

Table 1-1 Overview of the research questions

RQ 1	•What method of working does an experienced business analyst use?
RQ 2	•During which phases of the method (RQ1) is data available?
RQ 3	•What are the key elements of process analysis?
RQ 4	•How can the output of the preceding research questions be translated into a technical solution?
RQ 5	•Is an end user able to quickly and easily perform a process analysis through MagnaView PAS?

The first research question (RQ1) will be used to generate an overview of the method of working of experts in the field of process analysis. The next two questions (RQ2, RQ3) are based on RQ1, only those questions ask for more specific information. By answering the fourth research question (RQ4) the output of the preceding questions (RQ1, RQ2 and RQ3) will be used to perform a technical solution. This technical solution will lead to a new version of MagnaView PAS, which will be an automated process analysis tool. In the last research question (RQ5) the new tool will be tested and defined to establish whether it is a satisfactory solution.

1.4 Research Method

A conceptual setup is required as a basis for the project. Van Aken et al. (2007) discuss the methodology of business-problem solving (BPS) projects, carried out by business students. BPS projects are undertaken to improve the performance of a certain business system or organizational unit. (J.E. van Aken, H. Berends, H. van der Bij, 2007) The business system of this project is the process analysis tool of MagnaView.

The setup of this project is based on the classic problem solving cycle or the 'regulative cycle' by Van Strien (1997). The regulative cycle has five basic process steps as can be seen in Figure 1-5.

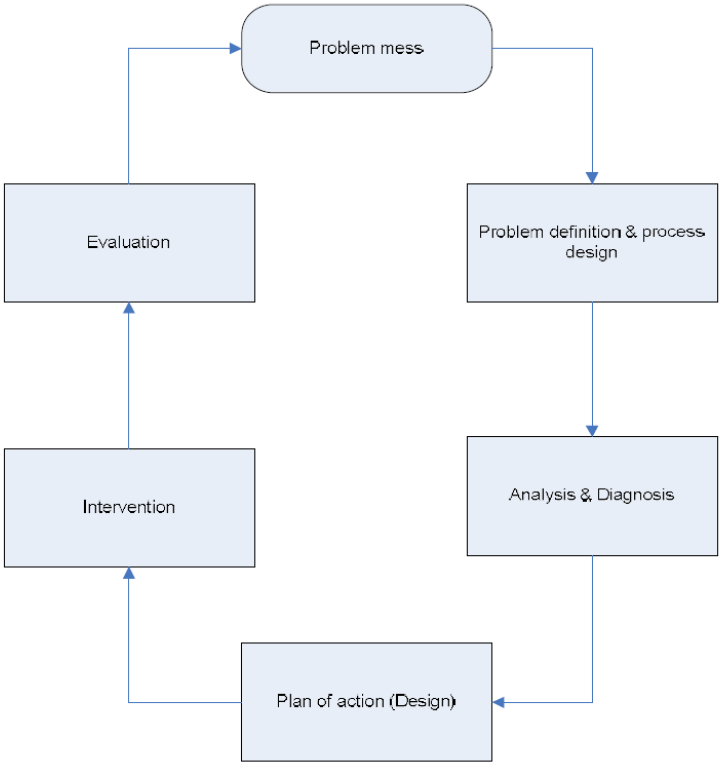

Figure 1-5 The regulative cycle

Problem definition

The problem definition step drives the whole BPS project. It is based on an agreement between the principal of the project, the university supervisors and me. The problem has already been defined in the preceding paragraphs. *Problem statement: How can the experience of a business analyst be incorporated in MagnaView PAS in such a way that an end user (non-BA) quickly and easily gains insight into business processes?*

Analysis and diagnosis

The analysis and diagnosis step is the analytical part of the project. For this step most of the traditional methods of business research can be used. During this step the current state of affairs will be stated; how the BA performs process analysis, what the ability of the end user is like and what the properties of MagnaView are like. This will be analyzed and a diagnosis will be stated.

In an ideal situation a lot of different business analysts would be interviewed and observed in order to get an idea of their method of working. The number of BA's and the variation in between them are important for the results. With a large sample size the results will be more reliable. Also the variation between them influences the results, e.g. when the BA's are all active in the same industry and have the same toolbox then it will be likely that they use the same method of working. The result of such a research will be based on BA's of the same kind and will not say much about the reality. The intention is

to come up with a generic method on a basal level, which shows the basic activities of a BA. Therefore the intention is to base this research on BA's of different companies, working with different tools.

It is clear that the sample size is important for the reliability of the results, but also the way of extracting the information from the BA's. The different ways of extracting are; interviewing, observing and analyzing the logs of their software tools. For the completeness of the research a combination of these three would be ideal. Despite the lesser reliability only the interviewing approach was chosen in this research. Observing would take a lot of time and the logs were mostly not available. The analysis of the logs would also take a lot of time.

Through interviews the input of information will be gathered from experts. The results of the interviews will be supported by scientific literature in order to support the reliability of this research project. Later in this paragraph the sources of literature will be elaborated.

The interviewees are experts in the field of process analysis. MagnaView stated that it is not possible to observe experts, nor to analyze the logs of MagnaView. The logs, produced by the MagnaView tool, are not suitable for analyzing. Therefore, the interviews with the experts will answer the first three research questions. An iteration of the interviews is considered, because it is conceivable that some new questions will arise after the interviews. The interviewees will be selected by MagnaView.

After the interviews, the current state of affairs can be made up. The type of answer to these questions will be a flowchart of the current way of working of a BA.

No attention will be paid to the current version of MagnaView PAS, because that is simply not relevant. The current version of PAS has a lot of different subjects and techniques. The tool is too complex for the end user according to MagnaView.

Plan of action

During the plan of action step one designs the solution for the problem and the associated change plan. (The most powerful support, however, can be given by field-tested and grounded technological rules or solution concepts, developed by business research on the basis of the principles of design science research. Ideally, a systematic review of the literature concerned should result in a range of solution concepts to solve the business problem. (J.E. van Aken, H. Berends, H. van der Bij, 2007))Due to a lack of time this is not completely performed. What is done for the plan of action step is discussed:

The output of the interviews will result in ideas for the prototype of MagnaView PAS. These ideas will evolve into a process analysis tool. Half way this step, which will be in the beginning of the 'plan of action' step, all the interested individuals will be notified by the intermediate results and ideas. This will contribute to a better cooperation and will benefit the project. The intention is to merge the thoughts of everyone into one harmonious conception of the project.

Intervention & evaluation

During the intervention step roles and work processes are changed on the basis of the solution design and change plan. Usually the student has left the company by then. As discussed above, the next step is

the process of learning to work within the new system and to realize the intended performance improvement. Therefore it is appropriate to plan a formal evaluation at a point in time, when one expects most of the learning to have been achieved, to see what still has to be done to realize the full potential of the new system.

To check if the semi-automated process analysis tool works in reality, MagnaView will supply a dataset for analysis. User tests will be organized for several end users. Based on these results the conclusion and recommendations can be stated.

Planning

A home stretch planning will ensure the feasibility of the project, this planning will be made 2 months before it is planned to finish the project. This planning will be more detailed, compared to the first planning. During those last 2 months the planning will be checked more regular and adapted.

In the starting phase a research project often evolves in many directions. But from the implementation phase delineation of the target, by making the necessary decisions and suppositions, will ensure a feasible outcome.

Literature

Literature can be found in scientific papers, retrieved from digital databases such as Inspec and Publish or Perish 3. Initially there were searched for journal papers and approximately 90% of the papers are journal papers. The others are conference papers. During the search process several keywords (combined or single) are used, such as ‘business analysis’, ‘business analyst’, ‘BPM’, ‘Performance Measurement’, ‘Healthcare’, ‘Mental-healthcare’, ‘process analysis’, ‘ automated’.

A second way to search literature is the use of handbooks and encyclopedias. These sources are not of the same quality as scientific journals, but are important sources of reference to relevant and scientific literature. Searching via references is sometimes called the ‘snowball-method’: a reference in one article points to other articles, references in those articles point to an even wider set of articles and so on. The sets of relevant articles expand just like a snowball gets thicker and thicker.

Another input of literature is Dr. ir. H.A. Reijers of the TU/e fac. IE&IS. He recommended the references mentioned below. These books have been purchased and describe business analysis in practice.

- W.J. Kettinger, J.T.C. Teng, S. Guha (1997) Business process change: A study of methodologies, techniques, and tools.
- A. Sharp, P. McDermott (2009) Workflow modeling (book)
- P. Harmon (2007), Business Process Change; A Guide for Business Managers and BPM and Six Sigma Professionals (book)

Report

In this report the process towards the outcome will be reported in such a way that this research project is reproducible. So the problems and decisions which lead to the outcome will also be reported. The report outline will be discussed in the next paragraph.

Backup plan

To secure the results of this project a backup plan is needed. The interviews are the main source of information input. This is also the most risky factor of this research method. When the desired results are not obtained during the interviews, this backup plan will be deployed.

1. Some extra interviews will be performed in order to increase the sample size of the experts. An increased sample size may enhance the results of the interviews. But if the original method does not work, then chances are that this backup plan would also not work.
2. The input of MagnaView will be the second and last backup plan. MagnaView already has ideas about the method of process analysis. These ideas are based on experience and practical literature, such as handbooks.

1.5 Report Outline

The structure of the report is based on the requirements of the master thesis manual of the TU/e. The APA publication style settings in Microsoft Word 2007 have been used. And the book Research Methods (A.M. Graziano, M.L. Raulin, 2007) has been consulted to come up with a structured report.

The remainder of this report is organized as follows. Chapter 2 is devoted to the “original” process analysis method; this process analysis method is derived by interviewing experts in the field of process analysis. The conclusion of this chapter will be a practical process analysis method, which will be used as input for the next chapter. In chapter 3 the “original” process analysis method will be transformed into a process analysis method for the end user. Due to the different properties of the BA and the end user the method will differ significantly. This newly developed process analysis method for the end user will be implemented into MagnaView. This is described in the fourth chapter ‘Method to tool’. The new process analysis tool of MagnaView is called MagnaView PAS and will be validated in chapter 5. This report will be finalized with a conclusion, in which also recommendations for future work will be stated.

At the end of the report, a bibliography with the consulted literature can be found and also several appendices which support the understanding of the report.

2. Process analysis method

The process analysis method of an experienced BA will be described in this chapter and considered as origin for this research project. The method of an experienced BA is chosen because it is the most common method in practice, but also in order to generate an effective and efficient method. It is assumed that an experienced BA works more effectively and efficiently than a non-business analyst. Actually this method relates to the first research question and there are several ways to answer that question.

Within the available time, the interviewing approach has been chosen to come up with the process analysis method of experts. The interviews were held to gather information from experts. Such information is required as input for this research to determine the requirements of the process analysis tool of MagnaView. By performing interviews with experts the main reasoning those during process analysis will be obtained.

The results of the interviews can be found in the following sections. In the first paragraph the team of experts will be introduced. The second paragraph of this chapter will discuss the structure of the interviews, which is important to get reliable results. Section 2.3 discusses the results of the interviews, including the conflicting and corresponding information. The corresponding information consists mainly of the basic activities performed by the experts. There will be references to literature for most of the activities in order to support the results of the interviews. At the end of section 2.3 the future work will be discussed. From the results stated in section 2.3, a process analysis method can be derived which is described in paragraph 2.4. The key elements of the BA will be implicitly stated in the paragraphs of chapter 2. But paragraph 2.5 will discuss the key elements of the BA explicitly. Finally, the chapter will end with a conclusion.

2.1 Team of Experts

The team of experts consists of 5 different experts; they are presented in the table below, see Table 2-1. The experts are not related to each other, except that they are all experienced business analysts. Each expert has his/her own approach to perform data driven process analysis. It is assumed that the main reasoning will be the same, but this will become clear after obtaining the results of the interviews. Four experts are provided by MagnaView. Robert de Groot of KPMG is the only expert who was provided by me. A sample size of four is not much and for that reason I started to contact experts in the field of process analysis and found one expert more.

Table 2-1 Overview of the interviewees

Name	Company	Expertise	Type of industry
1. **Anne Rozinat**	Fluxicon	Process mining	Service industry
2**. Reinder Graveland**	Spartners	Lean thinking	Manufacturing
3. **Ronny Mans**	TU/e (PhD)	Process mining	Healthcare
4. **Martijn Wijffelaars**	MagnaView	Data analysis	Secondary schools
5. **Robert de Groot**	KPMG	Process analysis	Finance

Martijn is the only experienced user of MagnaView and is an expert in the field of data analysis, which is a part of process analysis. Extra information about the experts can be found in the summary of each interview, see Appendix B. Prior to the interviews a structure has been set up to secure the reliability of the results.

2.2 Interview Structure

One generic layout is used for all the interviews and has an open basis. The layout of the interview was prepared in advance and printed in hardcopy, which ensured that all the interviews were conducted with the same questions. The layout of the interview can be found in Appendix B.

Some interviews were held by telephone and others during normal (face to face) conversations. This type of interviewing was chosen because it will enhance the performance and because the amount of interviewees fits this type. With this direct approach the control will be secured, because extra explanation can be given when a question is not directly understood. It is also possible to ask for a more detailed response when a superficial answer is given. The interviewee will be more interested during such an interview compared to a questionnaire by internet.

The average time for performing an interview was ±50 minutes. By keeping the interviews shorter than one hour, the participant is still motivated at the end of the interview. When interviews take too long participants can get bored or uninterested, this is prevented in this way. In order to cope with confounding, the interviews were conducted in a time span of twelve days, despite the holiday of one expert. Combining these points into one research design improves the validity of the data by decreasing the chance of biased scores.

In order to generate reliable data from the interviews, the interviews with the participants were voice-recorded (with permission of the participants). By recording the interviews, it was possible to optimize the interview-approach and skills of the student by replaying interviews and to learn from previous interviews. It also made it possible to perform the interviews in a consistent way by interviewing the participants in a similar way. This increased the reliability of the data. The interviews were listened to more than once in order to make a summary of each interview. The structure of the interview set-up is reflected in the summary.

Problems

During the interviews conflicting information and limitations need to be taken into account. This is not only related to the content, but also to the structure of the interviews. The consequences for the extracted information are described hereafter.

Often the conflicting information was due to the fact that the interviewees answered questions on different levels of detail. Therefore it was required to keep on asking for more information. At the end, only one interviewee was phoned twice to ask some extra clarification about his answers. Problems with the connections during the phone calls lead to expending extra time, because Reinder and Robert were answering the questions while traveling by car.

After the first interviews it became clear that the interviewees answered the questions differently. The type of answer was the same, only it differed in content. The answers were not contradictory, but it seemed that in the short answer (important) details were missing. This was solved by asking the interviewee explicitly for a confirmation of that answer. It was usually confirmed and support with the words: of course.

The conflicting information or limitation related to the content of the interviews is discussed in paragraph 2.3.1. Section 2.3 will discuss the results of the interviews.

2.3 Results from interviews

The interviewees correspond in their approach on several points. These findings will be discussed in this paragraph. Finding the similarities and the basal approach of process analysis was more difficult than expected. Some conflicting information was found and other information was out of the scope of this research project. After some rework, some checking and some decisions a basal approach of process analysis was set-up. Actually the results of the interviews can be divided in 3 parts, namely:

1. Conflicting information
2. Corresponding information
3. Future work

These subjects will be discussed in the next paragraphs.

2.3.1 Conflicting information

The conflicting information of the interviews is also part of the process to deduce the outcome. Because of conflicting information, choices and concessions need to be made. This paragraph will elaborate on the conflicting information. The corresponding information and the future work which resulted from the interviews will be discussed in the next paragraphs.

Initially the aim was to come up with one basal approach, but due to conflicting information of the interviewees that was not completely possible. It seemed that the experts are interested in different aspects of the business process to be analyzed. This became apparent after two or three interviews. The difference between the experts had to do with the difference in software packages and the type of industry they are working in. It seems logical that the different types of industries may lead to other interests during process analysis. Hereafter the performance indicators will also be discussed which are directly related to this conflicting information. The choice was clear: a process analysis tool needs to be industry specific, the analyzing technique may be the same, but the performance indicators are different. From the third interview on, the expert was asked if he agreed on this point. This is also the reason that one of the interviewees is phoned twice. Actually the first interview was very extensive and complete, so that was not necessary.

Industry

There are several potential industries in which to apply the PAS tool. Each industry requires specific results to be obtained. Below several industries are listed;

- Service industry
- Producing industry
- (mental)Healthcare
- Financial industry
- Administration

It will probably be better to make PAS industry specific, because each industry has its own requirements. E.g. the production industry is already well engineered, but still asks for more efficiency. The service industry is more focused on customer satisfaction. And healthcare is characterized by the diverse processes and patients; often each patient has its own pattern. An innovative organization will supports its employees to be creative, a lean and mean way of operating could be conflicting with the main targets of an innovative organization.

2.3.2 Corresponding information

Even fairly simple measures can provide useful guidance to identify problems, this was one of the corresponding findings in the interviews. This is a perfect introduction for this paragraph because it concerns the method of process analysis. It even supports the ability to perform process analysis by a non-BA. This paragraph discusses the remaining corresponding information divided in subjects in order to structure the outcome of the interviews.

Table 2-2 represents an overview of the different aspects, including an assessment of them. These aspects can be seen as components of the process analysis method, which will be derived in the next paragraph of this chapter. A single aspect is required to come up with a part of the results and could be an indicator, chart or just an overview. But a correct selection and sequence of the aspects is required in order to combine the sub results into the desired overall results. An arbitrary sequence makes a process analysis not logic, first the aspects based on discovery needs to be explored and after that the

performance will be indicated through other aspects. The performance indicator aspects are sequenced at importance for that type of industry and also on the type of problem. The aspects can be seen as individual soccer players, the correct choice of individual players in combination with the correct position makes a great team. So the correct set of aspects in combination with the correct sequence of aspects makes process analysis successful. The literature concerned was briefly studied to come up with some references, aiming to support the findings of the interviewees.

Table 2-2 Overview of the aspects

Type of aspect	*Experts*					*Brought up*	*Confirmed*	*Total score*
	1.	*2.*	*3.*	*4.*	*5.*			
Data transformation	+	x	+	+	x	2	3	3,5
Problem identification	x	+	x	+	+	3	2	4
Performance indicators	+	x	x	x	+	2	3	3,5
Patterns	x	+	x	+	x	2	3	3,5
Organization	x	+	+	x	+	3	2	4
Time	+	+	+	x	+	4	1	4,5
Efficiency & Effectiveness	x	+	x	x	x	1	4	3
Financial	+	+	x	x	+	3	2	4
Remarkable situations	x	+	x	+	x	2	3	3,5
Presentation	x	+	x	+	x	2	3	3,5

+ = Brought up, x = Confirmed

In Table 2-2, each aspect was assessed for each expert. This assessment was done after the interviews in order to structure the several aspects. Each row represents an aspect and the experts are presented in columns. Each cell reflects the assessment of one expert for each aspect. Three types of marks are possible: +, x or nothing. When the expert him/herself brought up the subject it is marked with a '+'. When the aspect had not been addressed during the interview, it is explicitly asked. By confirming the importance of that aspect it is marked with a 'x'. An empty cell means that the aspect was not addressed during that interview or not confirmed, but this did not occur during the interviews. None of the aspects were dismissed, otherwise those would be discussed in de preceding paragraph. Each aspect is elaborated in one of the sections below.

Total score

The total score of each aspect is in the right column and is ranged from 0-5, with steps of 0,5. The way of calculating the total score was made up by myself, when an aspect is brought up by an expert it counts as 1 and when the aspect is asked and confirmed by the expert it counts as 0,5. The sum of these values is the total score. The reason for scoring the aspect is to make a distinction in ranking between the different aspects. The 'time' aspect has the highest score and the aspect 'efficiency & effectiveness' has the lowest score. There is not much difference between the different subjects. I realize that the different scores might also be explained by the character of the expert and the industry they are working in. Some aspects are less relevant for certain industries. And the character of the expert makes an answer

elaborate or brief. In table 2-3 it seems that expert 2 elaborated his answers more than expert 3, hence expert 2 brought up many more subjects. With a higher sample size of experts the influence of these factors will be less.

Data transformation

Process analysis often involves analyzing summarized data and combining data from multiple operational systems. To facilitate this, data can be extracted from operational systems and loaded into a data warehouse. This process is referred to as extract, transform and load (ETL) in the business intelligence area (Howson, 2008). The "extract" process of ETL is normally done by the companies themselves, so the BA has nothing to do with that. The "transform" process of ETL is often the most time-consuming, particularly when multiple, disparate systems are involved. This was also indicated by the interviewees. Inconsistent codes (ID's), handling of incomplete data, changing codes to meaningful terms (1 = coated, 2 = not coated) are all part of the transform process. And loading the data during the "Load" process is not difficult or time consuming. Henceforth the term 'ETL' (Extract, Transform and Load) will be used in this report.

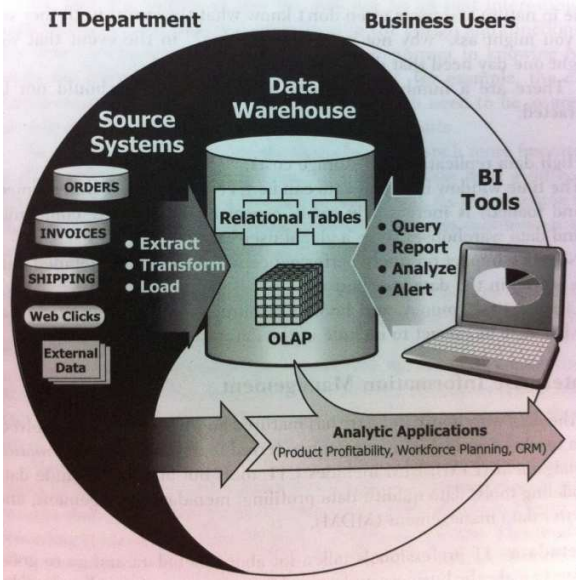

Figure 2-1Major components in the business intelligence life cycle

Problem identification

The problem indication of the company is not always correct. Often, after analyzing the complete dataset another problem turns out, as was expected in the beginning. This depends on the complexity of the business process, e.g. when a business process is much more complex, than the chance will be higher that the problem definition in the beginning will be wrong.

Organization

It is important to get an idea of the organization in order to analyze the business process properly. The first phase in the BPTrends enterprise methodology focuses on understanding the enterprise as a whole. (J. Prokop, V. Repa, 2008) An organization chart can help to understand the layout of the company. It is absolutely critical that everyone understands and agrees on the basic value. Everyone is all the people (interviewees, management board) who the BA has to deal with and of course the BA him/herself.

The organization as a whole needs to be checked, because general information can be valuable to decisions that need to be made. Even the context of the organization is important in assessing the business process. The difference in levels of business processes needs to be clear, to judge the business

process correctly. In the next paragraphs it will be clear why the main targets of the company are important for the analysis of one business process.

Performance indicators

Performance indicators (PI) are measures of how well organizational objectives are accomplished (E. van Geer, et.al., 2009). The Key Performance Indicators (KPI's) are seen as the minimum set of PI's needed to monitor an organization's performance in terms of goal accomplishment. A (K)PI therefore consists of two parts: measuring the performance and assessing the control limits which the actual measured performance should be within (S. Flapper, et.al., 2009). A (K)PI is part of an aspect, but an aspect may consists multiple KPI's.

It is advised to collect measures (and set KPI's) to evaluate success after you have finished. They will be fundamental to determine critical performance metrics and you will need this baseline to measure the performance of the new process. An instrument to measure the KPI's is the balanced scorecard, this can be used as a strategic management system. The balanced scorecard is popular in practice and is also used to implement new business strategies based on KPI's (R.S. Kaplan, D.P. Norton, 1996). The balanced scorecard helps to translate the business strategy into four perspectives, namely:

- Financial
- Customer
- Internal business process
- Learning and growth

These perspectives are related to each other and needs to be balanced.

Patterns

For an analyst it is important to know volume patterns, especially to get an idea of the situation. Analyzing the volumes of the process can be seen as the discovery phase.

- Total volume of frequency (e.g., customer enrollments)
- Proportion of different cases (e.g. new versus reinstatement)
- Proportion of different paths (e.g. straight through versus credit or background check)
- Proportion of different results (e.g. accepted versus rejected)

Financial

The BA tries to make use of financial information, he is able to convert it into something valuable. Despite the use of financial information, the BA cannot base everything on it. The financial information may be useful in identifying a problem, but tackling the problem often leads to a short-term solution. For the longer term solution, you often look beyond the financial flow and focus more on the quality- or time-aspect.

The distribution of the cost over the process can be useful, particularly if not all the activities are dependent on each other. In general, the highest cost activities are preferred to be performed last. This

also counts for the error-probability of an activity, when that probability is low, you want to perform that activity last. Low cost activities with a high probability of failure are preferred to be performed in the beginning. (A. Sharp, P. McDermott, 2009)

Remarkable situations

During the discovery part of the analysis it is good to look at the remarkable situations. Such situations are remarkable when the variation in combination with the importance of each event is significantly variable. The BA can do that based on his intuition, obtained by his experience in combination with his knowledge. For some reasons, e.g. when there are no KPI's, the BA will look (search) into more detail at remarkable situations. When the BA is looking into more detail, he will analyze the data to find remarkable situations.

The process activities can be analyzed in two ways, namely by the 'variation approach' and the 'norm approach'. Both approaches are seeking for remarkable situations, such as skewed ratios, odd numbers, etc. The variation approach judges the findings through comparison with the other data. An event (activity, employee or machine) is judged as remarkable if the data differs significantly from the other events of the same kind. E.g. during a production process, 11 welders are carrying out the same activity, namely the welding of an aluminum frame. On average this takes 35 minutes. Jan welds an aluminum frame in 55 minutes, which is significantly slower than the other 10 welders. So, Jan is a remarkable situation.

The 'norm approach' judges the events by a norm, which is set in advance. By judging the events by norms, other findings can be obtained during an analysis. E.g. the activity of welding that aluminum frame, as mentioned before, has a norm of 30 minutes. The average of the 10 welders is 35 minutes and Jan welds the frame in 55 minutes. Now, the complete activity can be seen as a remarkable situation and not only Jan, as was done in the variation approach.

The 'norm approach' will deliver more reliable findings, at least if the norms are set correctly. Setting the correct norms has a lot of similarities with setting (K)PI's. Normally a KPI also has a norm.

The different aspects of events can be analyzed by both the norm or variation approach. By these approaches the remarkable situations can be visualized. The aspects will only be analyzed with these approaches if there are no KPI's available. If no KPI's are available, other indicators will be used as aspect, for example one of the subjects mentioned by the experts.

Time

There are three ways to measure the execution of the time aspect: cycle time, work time (waiting time), and time worked. Cycle time is the total elapsed time, from the time the cycle starts or is triggered until the cycle completes with all results accomplished. It is the time measure most obvious and relevant to the customer. (D.B. Harrison, M.D. Pratt, 1993)

Work time is the time the process is actually being worked on and 'time worked' counts the actual work hours spent on the process. If only one person at a time works on the process, work time and time

worked are the same. E.g. the assembling of a machine takes 2 hours, when one mechanic is working on it. Then the time worked and work time are both 2 hours, but when two mechanics are working on the same machine the work time will be reduced to one hour. The time worked will be the same as before, because two mechanics work each one hour on the process.

These patterns will become even more interesting in terms of opportunity for improvement when the opposite of execution time will be tracked: waiting time. There are four kinds of waiting time, namely: idle, transit, queue, and setup. Depending on the business process and dataset, these differences will be taken into account or not (A. Sharp, P. McDermott, 2009).

Time will be an important aspect of analyzing, mostly because it is well measurable, which does not mean that it is always done correctly.

Efficiency and effectiveness

Typical measures of efficiency and effectiveness include the following;

- What is the percentage of scrap or rework, whether it's a physical or information item?
- How many defects are produced, and where (time in process) are they produced?
- How soon are defects discovered? Early detection is important.
- How many compliments and complaints are received?

If appropriate, any of these can be further categorized by type, location or other criteria. (A. Sharp, P. McDermott, 2009) It is useful to try and get a rough measure of the cost per execution, and the cost of defects, both in scrap and rework, and in impact on the overall process. Financial information can be useful to the complete dataset, and therefore financial information is also a subject.

Presentation

The results need to be simplified, before they can be presented to the customer. During the presentation the common thread will be shown, details will be reduced to a minimum. The results need to be simplified, before they can be presented. The degree of simplification depends on the people to whom you present it. Requirements of the presentation, as they have emerged from the interviews:

- The presentation should not last longer than 30 minutes
- Only the connecting thread needs to be presented
- Make use of figures and graphs

2.3.3 Future work

The interviewees had some ideas about "should haves" of the MagnaView PAS tool. These "should haves" reflect to the improvement of the business processes and are out of the scope for this research. MagnaView PAS is a pure process analysis tool and does not include the improvements to the business processes. Therefore these ideas are classified as future work.

The financial investment should be related to the benefits of the improvement. Reinder Graveland mentioned that there is a difference between the investment in theory or in practice. Take for example

the debit of a new machine, this can be shown on a theoretical or on a practical scale. On a theoretical basis a machine will be debited in five years, but in practice the life span of a machine is much longer. Two examples are mentioned during the interviews, see the dots below. In the end, it needs to result in higher profits.

- Return on investment (ROI) > Reinder
- Changemanagement, cost-benefit > Anne

Robert would like to see a workflow model of the process, like is done in process mining. But MagnaView is a visualization company and is not active in process mining, maybe it will be useful to do that in the future.

The book Factory Physics, 2008, of W.J. Hopp and M.L. Spearman explains the laws of the manufacturing industry. ROI is of the main aspect of the book. This can be used as a start on this subject. But it is important to keep in mind that the analysis of business improvement implementation is complex. Kaplan and Norton for example partly agree on the importance of the ROI, the ROI is only important for organization in development. For other levels of growth the ROI is less important, for example in the 'reap' level the cashflow of the organization is more important.

2.4 Process analysis method

The process analysis method is derived from the preceding paragraphs. The results of the interviews match on the (high level) main reasoning of process analysis. At lower level there were some differences. One difference was due to the fact that they use different software packages. A second difference was due to the type of industry which influences the flowchart of a BA at low level. This paragraph is used to state the flowchart of a BA during process analysis. That flowchart will finally be used to come up with a new version of PAS.

Legend of the flowchart:

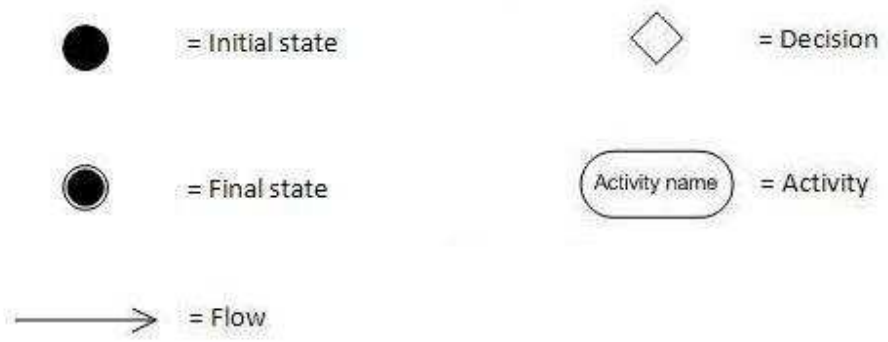

Figure 2-2 Legend of process analysis flowchart

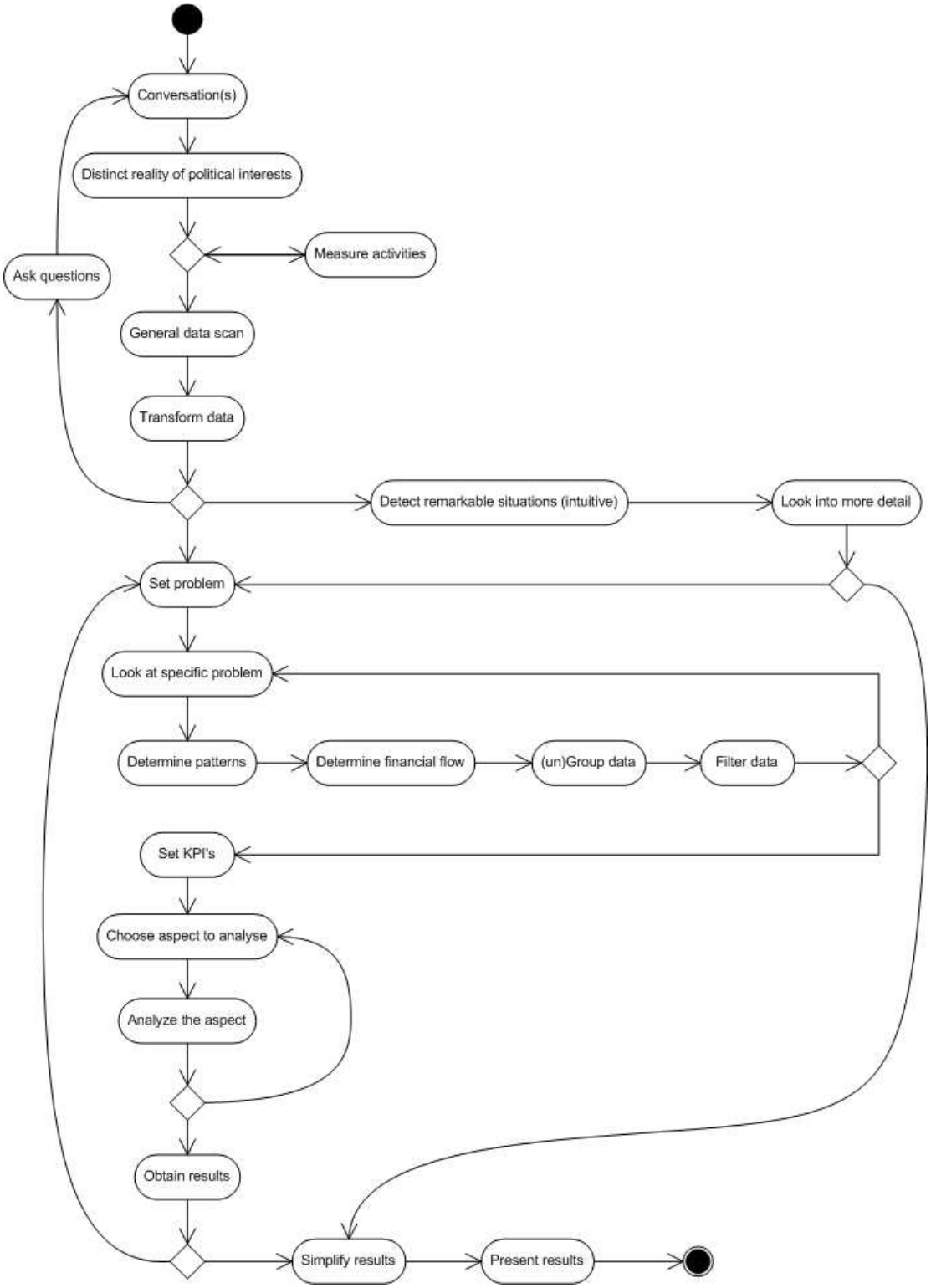

Figure 2-3 Process analysis flowchart of a business analyst

2.4.1 The Steps

This paragraph will discuss the steps of a BA in more detail. The process analysis method is derived from the interviews and a flowchart of the method is shown in Figure 2-3. The legend of the flowchart can be found in Figure 2-2.

Actually four main steps are performed during process analysis. First there are introductory conversations in which a lot of process information will be gathered in a short time. During these conversations, there should also be agreement on data. This data is supplied by the relevant organization and is needed in the second and third main step. During the second step the data will be checked and the third step will the aspect of the data be analyzed. After the data has been analyzed, the conclusions need to be presented to the organization. The conclusions are mostly simplified and presented in Microsoft Powerpoint as figures, tables or graphs, depending on the type of data.

1. Introduction into the process and problem (introduction)
2. Backing up process knowledge (discovery)
3. Identifying the problem (aspect analysis)
4. Presenting the conclusion (presentation)

Phase 3 is the most extensive phase of the method of a BA. Interviews showed that several core aspects are interesting for this phase.

Introductory conversations

The BA is new in the business process and needs information about the complete process to understand the data and context of the process. The BA gains that information through introductory conversations. The targets of the first conversations are:

- Understanding the processes
- Understanding the organization as a whole (what do they want to achieve?)
- Identifying questions (problems)
- Addressing agreements concerning the data
- Gaining the required domain knowledge.

Distinct reality of political interests

These conversations lead to a ‘subjective’ way of gaining the first information. An important aspect is to distinguish the political interests of the interviewees from the real facts. This needs to be considered during and after the conversations. The number of interviewees and type of interviewees differ for each situation. This depends on the complexity and organization of the business process.

Data

The amount of data is known after the first conversations, because during the conversations the parties agreed upon the data that will be used. This depends on which data is available and which is needed. When there is not enough data, the BA will indicate this and possibly start measuring activities for completing the dataset.

General data scan

The BA receives the data after the introductory conversations and immediately starts checking the data. Through checking the data, the BA checks his understanding of the business process. The BA also checks the completeness of the data. Does the data meet the expectations of the BA? The BA has the possibility to ask questions when details of the business process or data are not clear. It may take a lot of time before his questions will be answered and the BA can only influence that in one way, because the company will have to deal with the questions. Therefore he checks the data as quickly as possible, to ensure that the project will not be delayed.

Transform data

During the general data scan, the BA decides which part(s) of the data needs to be transformed. Transforming the data is an important and time consuming part of process analysis. In Business Intelligence the term ETL is used. Extracting the data will normally be done by the company itself and handed to the BA, as described before.

Remarkable situations

Sometimes the BA detects remarkable situations, while checking the data. These remarkable situations could possibly be explained when looked at more specifically. Sometimes these remarkable situations are the real problem of the business process and sometimes they are unexplainable outliers. Such situations may indicate major problems, which need to be presented to the process owner or management board of the company. The BA sees those situations based on his intuition. In 50% of the cases such situations lead to unexpected answers about the process analysis, which can be concluded form the interviews.

Define problem

When there are no remarkable situations at first sight, the data will be analyzed in more detail. This will be done bearing in mind the problem, as discussed during the introductory conversations. The problem will be set and looked at more specifically.

Discovery

First, the BA will determine the different patterns of the business process. By determining the different patterns an idea of the stream of products is generated. When there are a lot of different patterns, some work needs to be done and filtering irrelevant data can help the BA significantly. When the volumes of the business are not completely clear, this will be checked in this part. The volumes will be visualized and this will give a clear idea of the situation.

Set KPI's

The problem is set and the patterns of the process are known, so the KPI's can be set. KPI's and the use of a balanced score card are very useful in reaching the targets (R.S. Kaplan, D.P. Norton, 1996). With KPI's the BA can determine the performance of that business process. BA will also want to set KPI's for measuring the performance after a business process improvement has been done. By comparing the performance before and after the improvement implementation the variation can be set.

Normally KPI's are set to accomplish the main goal of an organization, but this can be contradictory to the performance of a single business process. These situations are not standard, but will occur in practice. The focus of this research project is on analyzing business processes. To prevent misunderstanding: when further on in this report the KPI's are discussed, this will be done on the process level and not the complete organizational level.

Aspect analysis

After setting the KPI's, the BA is going to look at the different aspects, as is partly described in paragraph 2.3. The importance and usability of each aspect is depending on the data and type of industry. The completeness of data and type of industry are preconditions to perform process analysis. For each industry another aspect can be more important and therefore more interesting to look at. Also when the dataset does not contain any data about that aspect, it will not be possible to analyze it. The sequence of aspects in this phase of the analysis depends on the importance of the aspects, normally the KPI's are very important. The KPI's of an industry are under multiple aspects. The type of problem is also influenced the sequence of aspects. The correct sequence of aspects will enhance the efficiency of performing process analysis.

During the analysis a lot of decisions need to be made. This all depends on the results so far. The data can generally be analyzed in two ways; either by looking at the distribution of the values or by setting boundaries (norms) and looking which values transgresses the norms. Outliers and trends will be noticed through both approaches. The type of approach is depending on the availability of KPI's. The KPI's (including a norm) will be analyzed first, because of their importance. When the KPI's do not lead to the desired results, the analysis will continu with other aspects/indicators. This is a possible iteration, the next section discusses the iterations in more detail.

Obtain results

After this analysis the results can be obtained. There are two possibilities:

- the BA is not satisfied and it seems that there is the occurrence of another problem than was expected in the beginning.
- Or the problem is identified and will be presented to the management board.

Iteration

In the flowchart some iteration is possible, but not required. In practice it is unlikely to finish process analysis without iteration. This has to do with the progress in gaining insight into the business process during the analysis. With an increasing understanding of the business process, other decisions will be made than with a small perception. The views and analysis will become more detailed. The increase in detail is associated with the increase in knowledge. When the BA concludes that one aspect (e.g. activity, machine, employee) of the business process is not responsible for the problem, the BA will iterate this phase of process analysis with another aspect. When the BA concludes that a certain aspect influences the problem, he will analyze this aspect in more detail. This also explains the explorative way of working of a BA, which is mentioned in the interviews.

Presentation

After enough iterations the problem is identified by the BA. The BA will present the results of the process analysis to the business process owner or management board. It takes time to transform the raw results into presentable results, but is necessary to make it understandable to employees of the company.

After presenting the results, the BA has done his job and can start on a new project.

2.4.2 Validation

The process analysis flowchart of a business analyst in Figure 2-3, was developed based on the interviews. Often the actions are supported by literature. The interviewees are all experts in the field of process analysis and are all coming from different industries and companies. Each company (c.q. industry) uses its own toolbox and has its own approach at low level. The interviewees also have a similarity; they all have a connection with Eindhoven University of Technology (TU/e), which influences the reliability of the outcome negatively. All the experts took their PhD or achieved their Master at the TU/e. For validation other experts may need to check the model. The origin of the other experts should be other than TU/e.

This model is checked by Rob Kenens, therefore it is not completely validated, but it has at least one reference. The reference of Rob enhances the model. Rob is working at 'De Werkmaatschappij'[7], which is part of the Ministry of Internal Affairs and Kingdom Relations (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties). De Werkmaatschappij is a shared service organization of 650 men (turnover € 100.000.000,-) and 18 different business units. He and his colleague are internally responsible for Finance, Accounting Organization & Internal control, IT and law & regulations. The business processes are part of those divisions.

The origin of Rob is a Master of Science in Management at Neyenrode Business Universiteit[8]. Previous to that he performed a study in business administration at bachelor level at HEAO.

Rob agreed upon the model itself, but indicated that some business processes could be contradictory to the main goal of an organization. The overall goal of an organization needs to be kept in mind and it is important to accomplish the main targets of the organization. The total set of processes needs to accomplish the overall goal of the organization, hence some business processes are meant to accomplish contradictory goals. These contradictory business processes are simply needed in an organization, e.g. Chinese Walls in business. This comment of Rob did not change the method, because the (overall) organization was already mentioned, but not as explicit as Rob wants. It is easy to adapt this part and supply the end user of more information about the main target of the organization.

[7] For more information about De Werkmaatschappij, see http://www.de-werkmaatschappij.nl

[8] For more information about Neyenrode Business Universiteit, see http://www.nyenrode.nl

2.5 Key elements

The key elements of process analysis will be discussed in this paragraph. The BA's method of working was already shown in the previous paragraphs, but what is the BA doing that an end user is not doing? Or is not yet automatically performed in one of the several tools on the market? Of course the BA is experienced in what he is doing and therefore a BA is skilful and performs certain activities quickly. But in this project it is assumed that this kind of experience is not the keyword in making process analysis applicable to an end user.

The BA is able to distinguish the political interest of the employees from the real facts. To identify the problem of the business process, the focus should be on the facts and not on the political interest of certain employees. Therefore objectivity is important and subjectivity should be kept at a minimum. The BA can be considered as an outsider of the business process and therefore the unbiased eye of an outsider is an advantage.

The BA is able to quickly identify the right data, which can give insight into the problem of that business process.

Another important point is the intuition of the BA: with his intuition he looks at the distribution of the employees and other ratios of the business process. It is important to have an organization chart, or at least an idea of how many people are working in a certain department.

The BA tries to make use of financial information, he is able to convert it in something valuable.

The BA can bring up the required KPI's, including stating the norm of a KPI. Those KPI's are also important during the implementation of the business improvements, normally a balanced scorecard is used (R.S. Kaplan, D.P. Norton, 1996). This makes the performance measurable.

The last key element is the guidance of the BA, he handles guidance intuitively. In general the BA is conscious of what he is doing in performing process analysis. Therefore he knows what he wants to do and what he has already done. He knows his direction and which next steps he is going to perform in order to achieve the desired results. During process analysis the sequence of analyzing the different aspect enhances the efficiency of process analysis. Normally the BA has a systematic approach, see Figure 2-3 in the preceding paragraph.

2.6 Conclusion: reflection on outcome of interview process

The process analysis method of the BA is approved by MagnaView and corresponds with the thoughts of dr. Erik-Jan van der Linden, as was announced after the intermediate presentation.

Two main issues can be concluded:

1. The core aspects (selection and sequence) are important and need to be incorporated in PAS
2. The guidance of the end user is important to incorporate, in order to perform the correct order of steps and to analyze the correct sequence of aspects.

The analysis and selection of the correct aspects is more complex as discussed in this research project, but depends mainly on the type of industry. Therefore there was some conflicting information during the interviews and it was decided to make MagnaView PAS industry specific.

The key element of process analysis is the experience of the BA. Because of this experience, he knows which aspects are important and in what order these aspects should be analyzed. Especially the latter is an important element which makes process analysis for a non-BA very difficult. A BA performs the analysis intuitively, where a non-BA would get lost because of the amount of information that is shown. Therefore guidance or navigation of the end user is required

Less important characteristics of a BA are:

- Distinguishing facts from political interests during the introductory conversations
- Identifying the correct data for analysis, in consultation with the process owner
- Easily detecting skewed ratios of the business process, based on the first data scan or first conversations

This method of a BA will be used as a base for the method of the end user, since it is based on experts, several parts are supported by literature and the method is validated by one person.

3 Method development

After interviewing experts and mapping their process analysis method, a flowchart will be designed for the end user. The process analysis method of the BA will be the basis of the process analysis method of the End user. Due to the differences of the BA and the ability of the End user, the current method of the BA will be converted to an End user's method. This chapter will describe the translation of the method. First the influential factors will be discussed. These factors influence the design of the process analysis method of the End user. The process analysis method of the End user will be discussed in section 3.2. The conclusion in section 3.3 will finalize this chapter.

3.1 Factors

The end user aims to gain quickly and easily insight into his or her business processes. MagnaView PAS will help the end user to gain insight in the business processes. Figure 3-1 is an overview of the elements which lead to the process analysis method of the end user. The end user's method is in the centre surrounded by the 3 direct elements. The process analysis method of the BA was already discussed in the preceding chapter. But the other 2 elements will be elaborated in this paragraph.

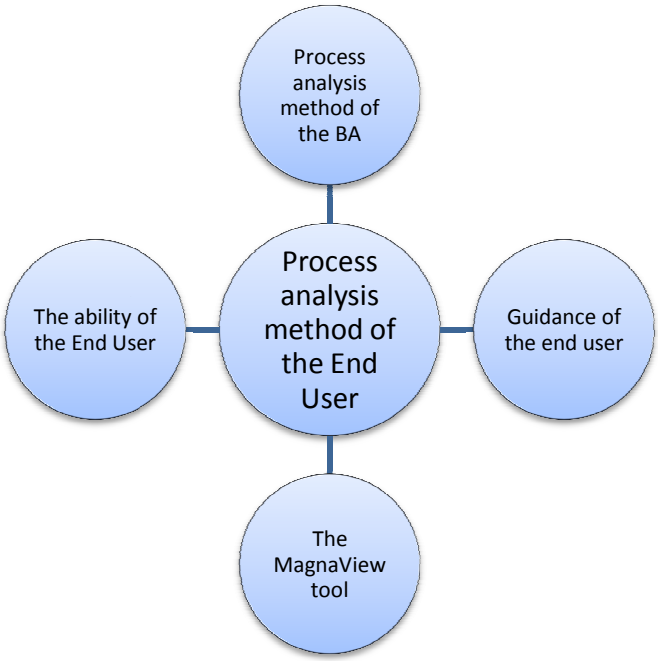

Figure 3-1 The influencing parts in order to design the process analysis method of the End user

3.1.1 Ability of the End user

The end user is an employee (non-BA) of a company, who will perform process analysis with MagnaView PAS. The end user does not have the industrial engineering knowledge and experience of a BA. Therefore the end user does not have the ability to work through the process of a BA. Normally the end user experiences problems during process analysis. This makes the ability of the end user one of the influencing elements for the development of the process analysis method.

Problems

Actually the ability of the end user is a limitation for the current method of process analysis. The missing knowledge and experience of the end user is the limitation at high level. However the knowledge and (in)experience of the end user cannot be enhanced, otherwise it would not be an end user anymore. So, the opposite factors will be adjusted in order to counterbalance the limitation in knowledge and experience. The opposite factors are factors of the method and/or tool, which make the knowledge and experience a limitation. These factors need to be clear and will be stated in this section. Further on in this report these factors of the method and/or tool will be used and developed to obtain a half-automated process analysis tool.

Complexity is one of the main problems for the end user. Complexity of both the data and the analysis method are co-responsible for the failure of process analysis. Regular people (non-BA's) do not know how to perform process analysis. They do not have a clear idea how to start, what they want to obtain at lower level and how to achieve that. In the method of the BA it is shown that iterations may frequently occur. After one or more iterations the end user will be astray and will not be able to finish the process analysis successfully. In order to make the method of the BA more transparent, it was decided to subdivide the BA's method into 4 phases, namely introduction, discovery, aspect analysis and presentation.

KPI's are an important factor of the third phase (aspect analysis) of process analysis, as is stated in paragraph 2.3.2. KPI's assess an indicator if the value of that indicator is acceptable or unacceptable. The end user is not able to set the correct KPI's, due to a lack of managerial knowledge.

The end user has not the experience of a BA and is therefore not able to detect skewed ratios in an organization. MagnaView PAS is required to help the end user in finding the skewed ratios.

Surplus value of an end user

The end user has also a surplus value compared to the BA. One of the major differences between the end user and the BA is the knowledge of and familiarity with the business process. The managerial knowledge of the end user is less, so that is a disadvantage of the end user. But an end user possesses domain knowledge, which a BA has to obtain by introductory conversations. The introductory conversations can be skipped in the method of an end user. One of the key elements of the BA was to distinguish the facts of the political interests of the interviewees during the introductory conversations. Since the end user already possesses the domain knowledge and the introductory conversations will be redundant, also this key element of the BA does not have to be incorporated in Magnaview PAS. Because of the data-driven approach of MagnaView there will be no political interests of employees in the tool. The other functions of the introductory talks, such as agreements on the data can be handled by the end user.

When the BA receives the data, he checks his understanding and the completeness of the data, as is stated in chapter 2. There can be misunderstandings on the occasion of the introductory conversations. If the BA has some questions, it may take a long time before they are answered and he has hardly

influence on that. The chance of these misunderstandings is less in the case of an end user and if the end user has a question, he knows who he needs to address directly. So the probability of delay is less.

3.1.2 Demarcation

This research project is extensive and therefore demarcation is necessary. The quality of the project takes precedence over quantity, despite the extent it already has.

Data transformation

ETL is an important and time consuming part of process analysis, as was already discussed in paragraph 2.3.2. ETL itself could be a master thesis project because of its complexity. MagnaView BV has already spent some research time on this subject and will be doing that in the future. Further on in this project it is assumed that the data quality is okay and that no transformation of the data is necessary.

Industry specific

The tool will be industry specific, based on the findings of chapter 2. For each industry other KPI's need to be set and other analysis aspects are attractive. The method will be as generic as possible, but the implementation (and also the practical use) will be industry specific. This project will applied in the (mental) healthcare, with a dataset of the GGzE. More about the implementation of this dataset will be discussed in paragraph 5.2. During the design of the new method it will be taken into account that a type of industry needs to be set.

Problem definition

The initial problem definition of an organization is often not correct and this will be clear during the performance of process analysis. In order to let the end user be aware of this phenomenon the problem will be defined in the beginning of his method and also in the course of his process analysis method.

3.2 The end user method

Based on the preceding paragraphs a process analysis method is designed for the end user.

An end user is not able to set KPI's for a certain industry or dataset, due to a lack of industrial engineering knowledge. This will be solved by setting these norms in advance, through the use of a BA. These norms only have to be set once.

The other decisions will be explained parallel to the explanation of the flowchart, which is described in the next section.

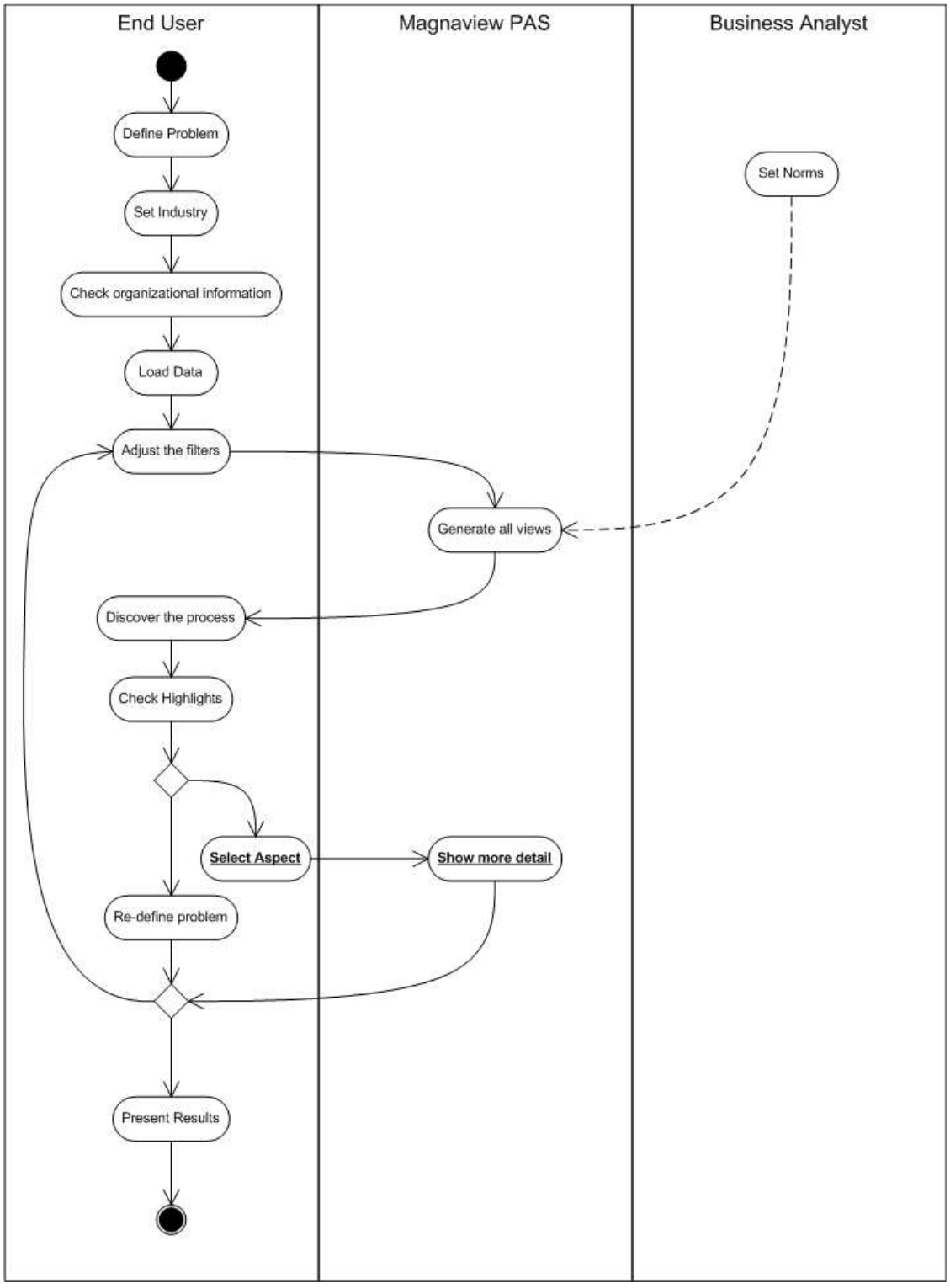

Figure 3-2Process analysis flowchart End user

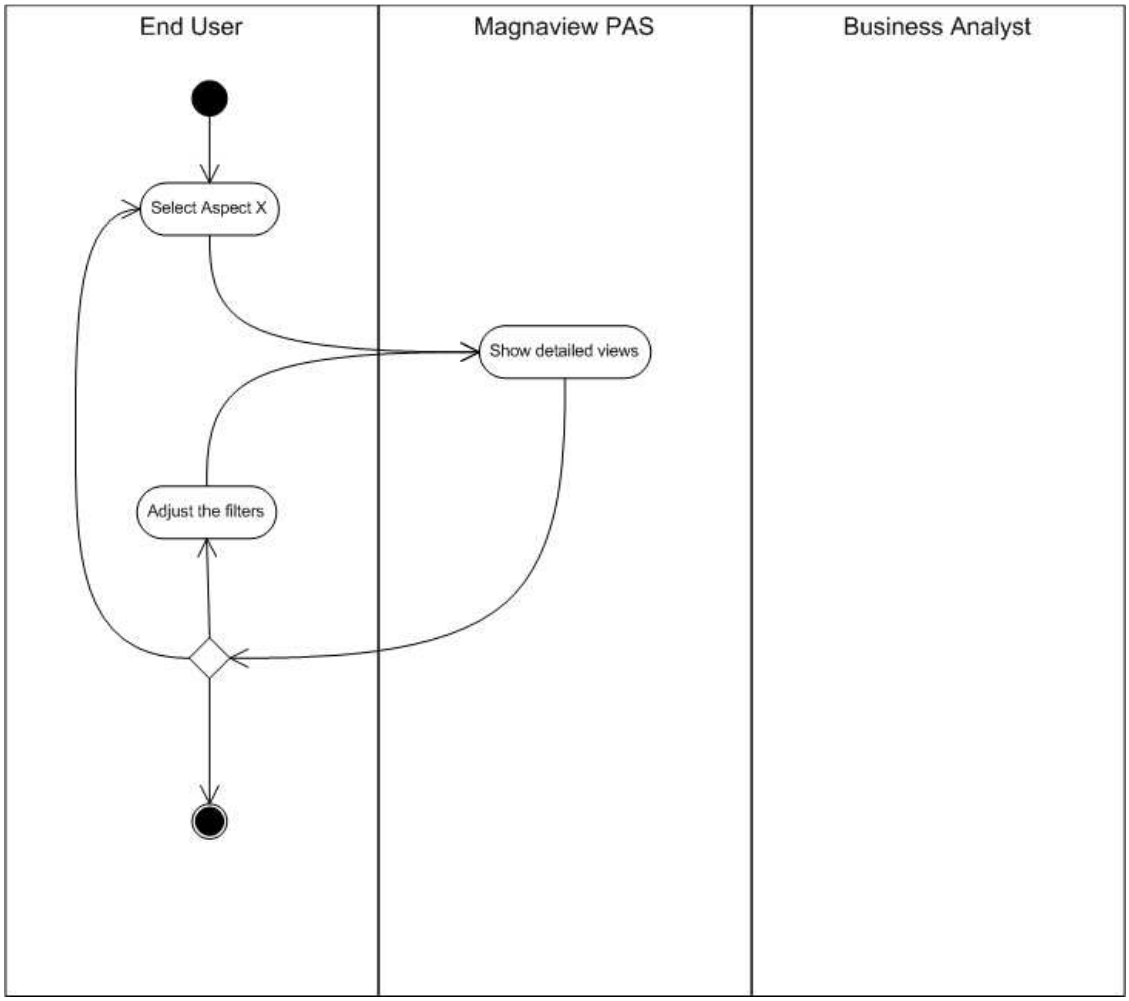

Figure 3-3 Low level aspect analysis

3.2.1 Steps

The new process analysis method of the end user is visualized in a flowchart, see Figure 3-2. The overall method can be subdivided in 4 phases, namely:

1. *Introduction*, this step can be done without process data
2. *Discovery*, this step is performed first to become acquainted with the business process. Later on this part can be viewed again to check facts about the employees, activities, etc.
3. *Aspect analysis*, this step is the core part of process analysis
4. *Presentation,* this is the finalizing step in order to present the results to the management.

The details of the flowchart will be explained in this paragraph, in order to clarify the steps. The steps are classified in the 4 phases. The 4 phases are also required to incorporate the navigation of the end user, which will be discussed in the next chapter.

1. *Introduction - Define problem*

The problem needs to be defined first. The problem definition must be entered in the software tool, or if necessary written down on paper. A definition of the problem is crucial for the mental process of the end user. The software tool will not use the problem definition.

Set industry

Due to the decision to make process analysis industry specific, which was made following the contradictory information from the interviews, the industry needs to be set. This will be done in the beginning of the process analysis method. The BA sets the industry automatically and he acts basically on his intuition, but the end user is required to set the right settings.

Organizational information

The organizational information consists of an organization chart and the main target of that organization. Probably the end user already possesses this information or can reach it in another way, but it is good to focus on the main target of an organization again. An organization chart is useful and easy for recognizing the structure of an organization.

2. *Discovery - Load data*

The loading of the data can be done earlier, but that will not make any sense because from now on attention will be paid to process data. This also applies to the loading of 'organizational information', which is actually also data. There is a difference, because the 'organizational information' dataset possesses information about the organization in general. And the 'data' dataset reflects to the data of the business process, which is going to be analyzed. The organizational information can be used for multiple process analysis.

Adjust the filters

The possibility of adjusting the filters is needed. Probably not directly in the beginning, but after iteration it would be logical to adjust the filters. Grouping and ungrouping are also features under the header 'adjust the filters'. Adjusting the filters in the beginning is possible, e.g. when the dataset is too complex and you want to group several employees or make a selection of the time, activities, etc. After 'Aspect analysis' there will be more clarity about the function of the filters, because than iteration may occur and the filters are desired.

Generate all views (MagnaView PAS)

Generating all the views is done by the tool, which also known as initializing the data.

Discover the process

The discovery of the process is done to become acquainted with the process. The activities, patterns, employees and financial information are elements of the discovery part. After the discovery, the end user has an idea about:

- the different activities, which will be performed first, second, and so forth, till the last
- the volumes (activities, employees, patterns, etc.)

- the patterns and their frequency
- the financial flow, where the money comes in and goes out
- the groups of employees (who perform the same activities)

3. *Aspect anaylysis - Set Norms (BA)*

The norms are set by a BA, because the end user is not able to set the norms. The same applies for KPI's. KPI's may already be known by the organization, otherwise they will be set by a BA.

It was aimed to let the end user perform these tasks, but during this research project no feasible options occurred. Therefore it is chosen to let the BA set the KPI's, which only has to be done once for every type of industry.

Check highlights

Now the general knowledge about the business process and organization is known, the industry and KPI's are set and the problem is defined, the core part of process analysis can start. The highlights of the dataset will be checked at a glance.

The tool needs to be equipped in such a way that the most important and remarkable things show up in a couple of views.

Redefine problem

Due to new insights, it is possible that the 'old' problem definition is not valid anymore. For that reason another problem needs to be defined until the correct one is found and the analysis will be presented.

Select aspect

According to the highlights an aspect can be selected to explore the aspect in more detail. A lot of different aspects can be selected, think of the different subjects in paragraph 2.3.2. The different aspects should be listed in one overview. First the most important aspects of that business process, normally those are the KPI's. Of course, a KPI is the most important indicator for that business process, but not all of the KPI's are related to the focus (problem definition) of the process analysis. Another reason for selecting an aspect, which is not a KPI, could be incompleteness. Incompleteness exists when the organization has no KPI's or the BA did not set them. If there are KPI's, but there is no relevant data, then it is also useless to select that aspect. For those reasons the aspect selection will not be a KPI, but one of the subjects mentioned in chapter 2.

Aspect analysis at low level

Aspect analysis at low level is done after the selection of one specific aspect. The detail views of that aspect are shown. The end user can view the aspects in more detail. At the same time the filters can be adjusted, just as was possible in the beginning. At this lower level, it is also easy to switch from one aspect to another.

4. *Presentation - Present results*

The connecting thread of the results needs to be presented to others. Visualizations are needed to present the results.

3.3 Conclusion

The process analysis method of a BA developed quite well into a process analysis method for the end user. In order to optimize the results of the end user, the KPI's needs to be set by a BA. This is acceptable because this only needs to be done once for each industry.

With a tool (incl. navigation) that suits this new process analysis method, the end user should be able to gain quickly and easily insight to business processes.

4. Method to tool

This chapter will relate the method of the end user to the process analysis tool of MagnaView. In this project it is not feasible to incorporate all the details into MagnaView in order to arrive a complete process analysis tool for End users. The MagnaView tool has not previously been discussed and will be elaborated in the next paragraph. The other elements were already discussed in the preceding chapters. The key elements of a BA were discussed in paragraph 2.4 and the end user's method is described in the conclusion of chapter 3.

Easily detecting skewed ratios of the business process, based on the first data scan or first conversations, is one of the key elements of the BA which is not yet incorporated in the tool or covered by the end user method. An analyzing technique is required to detect skewed ratios in business processes.

4.1 MagnaView tool

MagnaView is a company name, but also the name of their main tool. This was already introduced in paragraph 1.1. MagnaView delivers a representation of data in a way that is easy to comprehend and attractive to interact with. MagnaView is user-friendly, since it makes use of visual analytics and this appeal to end users.

MagnaView PAS

The PAS tool will basically be started as a new project inside MagnaView. So the standard architecture of MagnaView will serve as the basis for the MagnaView PAS tool. To get an understanding of the standard version of MagnaView a common screenshot will be explained. Figure 4-2 is a screenshot of MagnaView.

The MagnaView window consits of the following elements:

1. The name of the current project, located in the title of the window. In Figure 3-2: manual_views.mvp
2. The view itself, this is the visualization of the data. Its appearance is determined by the selected data attributes, a template and the color settings;
3. The *attributes, filters* and *actions tab*, on the left.
   Attributes tab, where you can see the field names that are available in the data source
   Filters tab, allows you to make selections in the data
   Actions tab, shows a list of possible actions that can be taken
   and the *color legend* on the bottom left, where the colors can be set;
4. The navigation toolbar containing
   - ✓ the menu items *file*, *edit*, *view*, *tools and help*;
   - ✓ Buttons for starting a new project , or to open an existing project ;
   - ✓ The undo and redo buttons ;
   - ✓ Buttons for loading a dataset ;
   - ✓ A button for switching to the the overview screen ;
   - ✓ Buttons for navigating through the views in the project **;**
   - ✓ The level up button which appears after you have zoomed-in;

- ✓ Buttons for selecting, hiding and showing selected tiles that show up when you have
- ✓ made a selection by dragging your mouse ;

5. The view toolbar containing
   - ✓ Buttons for applying templates and editing views **;**
   - ✓ Buttons for creating , deleting and duplicating ;
6. The name of the current view, in this case "Grades per Subject"
7. *Visible data*, the left most tab at the bottom. This data table shows the source of the elements that are currently selected in the view. When the mouse is hovered over an element in the view, the first row of the table shows the data of that particular element.
8. The comment box, the right most tab at the bottom.

As stated at point 2; a view is a graphical presentation of the dataset. And a project is a set of these views. In order to start a new project like PAS, the MagnaView Expression Editor is required. To use the MagnaView Expression Editor some familiarity with computer programming, formal languages or expression editors in spreadsheet applications is desired.

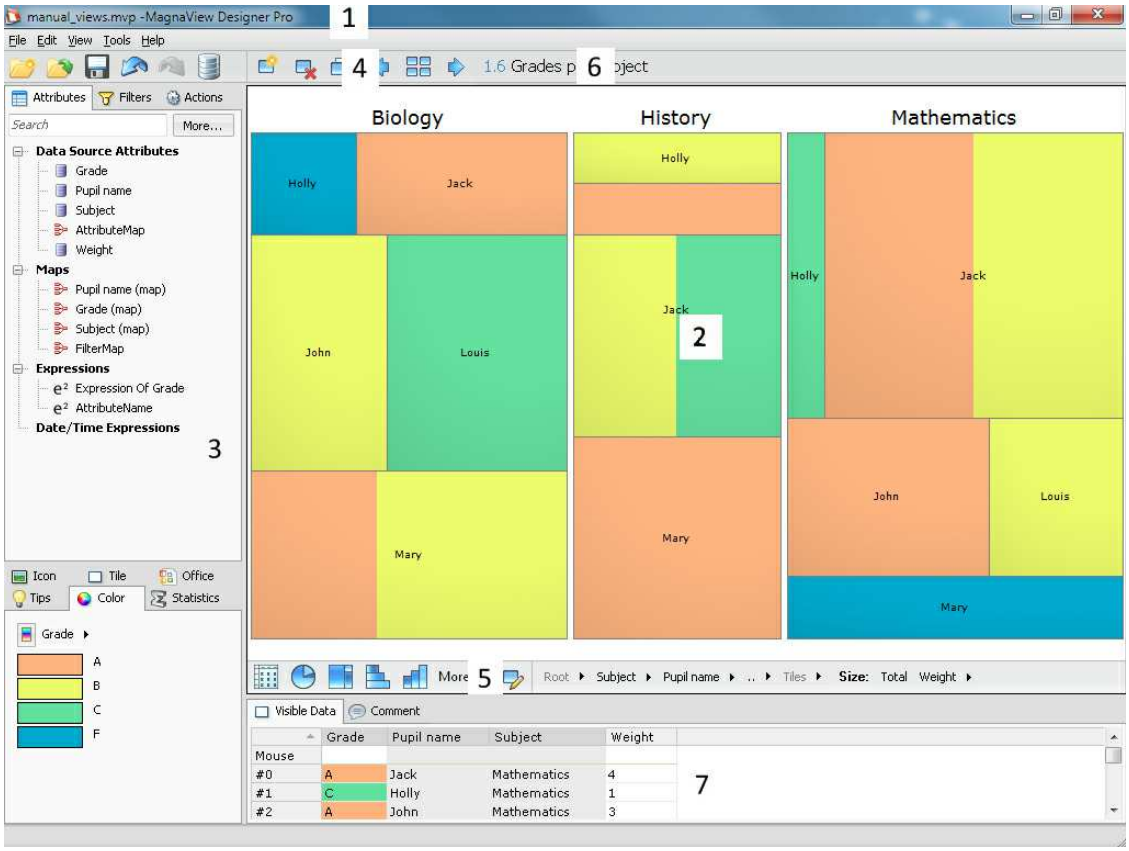

Figure 4-1 The MagnaView window

4.2 Navigation

Process analysis is performed exploratively, as was stated in chapter 2. But after some iteration the end user will get lost in his own process. Therefore the focus will be on the navigation of the end user. If the navigation problem of the end user is solved it is easier to solve the other problems. The end user method, as discussed in the preceding chapter, is completely incorporated in the tool. On only detail level some development needs to be done, so the aspect are incorporated superficial. The implementation of the GGzE (mental healthcare) will be discussed in the next chapter. This paragraph is a case study of MagnaView PAS. The case study is elaborated by screenshots in appendix E, this part is confidential, so it is possible that it is missing in this report. Through performing user tests in the future the following main problems of the end user can be found.

Implementation

During the incorporation of the navigation part a dataset is needed. In the beginning some random data is used. But for the validation of this implementation a correct dataset is needed to test it correctly. More information about this dataset can be found in paragraph 5.1. The screenshots in this paragraph are also connected with that dataset.

A general rule that is applied within MagnaView with respect to the navigation inside a view is the top-down and left-right approach. Western people read from left to right and from top to bottom, for that same reason the most important things needs to be visualized on the left side at the top. The less important things will be presented more to the right or bottom of the single view.

The guidance of the end user is important during the navigation part. The aim is that at any stage of the process the end user has a clear idea about where he is in his process and what direction to go. Therefore the flowchart of figure 3 -1 is used to guide the end user.

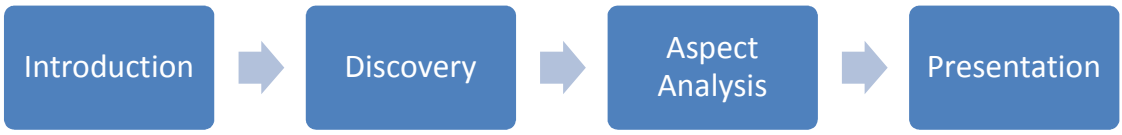

Figure 4-2 High level overview of the 'process analysis' process

First the activities of the flowchart are grouped and divided at high level, as can be seen in figure 4-3. This is translated to the ‘homeview’ of the end user in MagnaView PAS, as can be seen in figure 4-4. On the bottom left of the screenshot a table of content can be found, which is presented to help the end user navigate through his process.

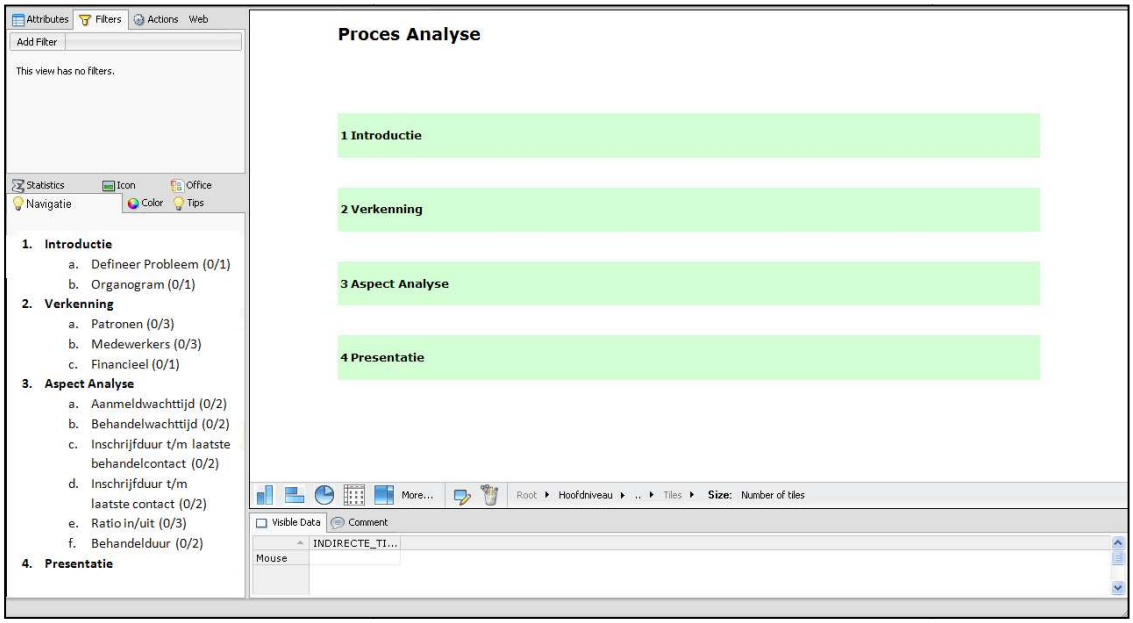

Figure 4-3 The home view of MagnaView PAS

Table of contents

The table of contents at the bottom left of the screenshot is placed behind the tab ‘navigatie’. This table of content is interactive; when an aspect is clicked on the corresponding view will be opened. With this table of contents it is also easy to navigate back to the ‘home view’, just by clicking on it. The location, where the end user is in his process, is visualized by the bold typed piece of text. The number of views is visualized after each subject between the brackets.

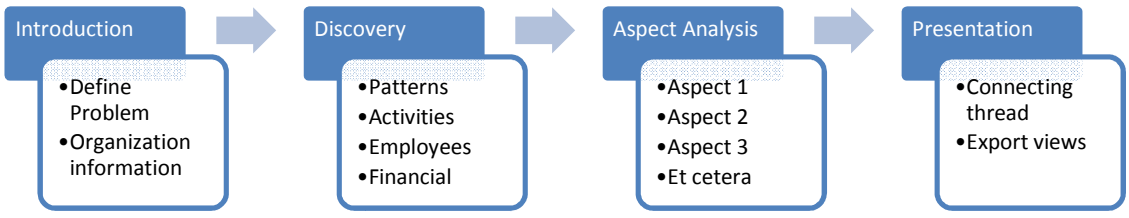

Figure 4-4 Overview of the 'process analysis' process

The dashboard is ideal for highlighting the most important and remarkable things. In a glance it is clear which aspects/indicators perform well.

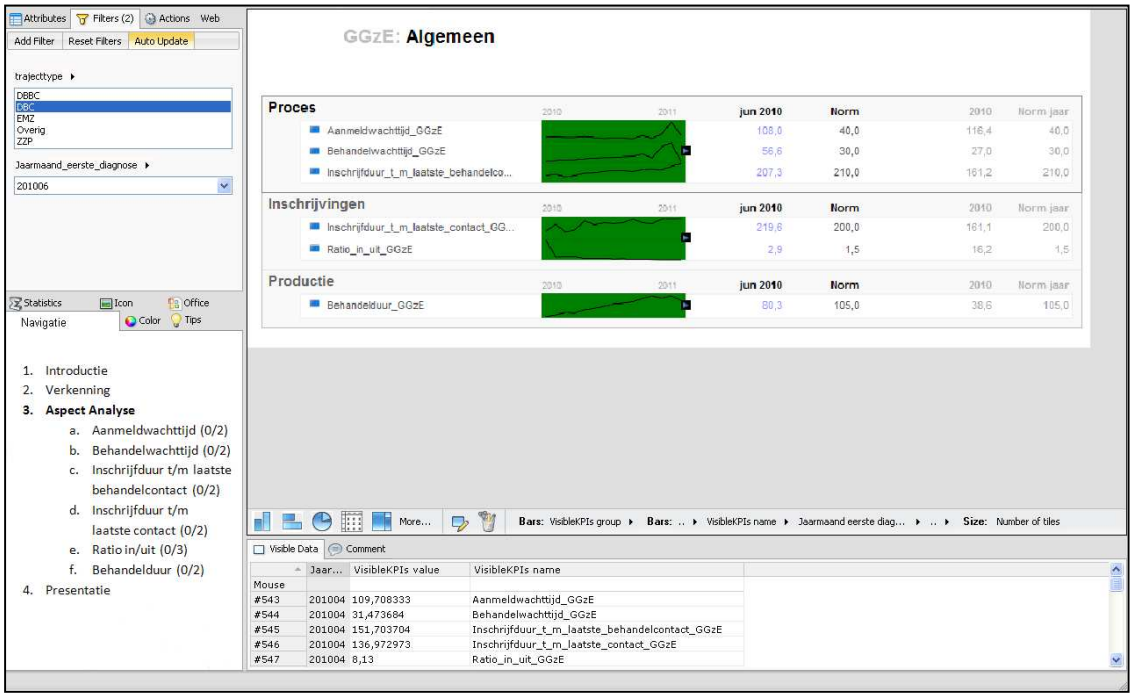

Figure 4-5 The KPI dashboard of MagnaView PAS

The aspect analysis follows the highlight check, in this dashboard it is possible to select an aspect. The most important aspect will be at the top. The ranking is based on type of business process, the availability of KPI's, the selection of industry. Subsequently the focus of the end user will make him choose one of the aspects. He is focused on his problem (which he identified in the problem definition phase) and will select an aspect which is related to the problem he defined. E.g. when the end user is working in a hospital and gets the assignment to analyze the process of meniscus transplantations, because the waiting times are too long in this area, he will set the healthcare industry and define the problem as: the waiting times are too long. The introduction and discovery part proceed smoothly. Then he will check the highlights, on top are the KPI's about quality and efficiency, it seems that they perform well. But the focus of the end user will be on the waiting times, and therefore he will not select a quality aspect. So MagnaView PAS indicates that the quality aspect is the most important aspect of that business process, but the end user will choose the (waiting)time aspect, which is merely on a fourth ranking in the dashboard.

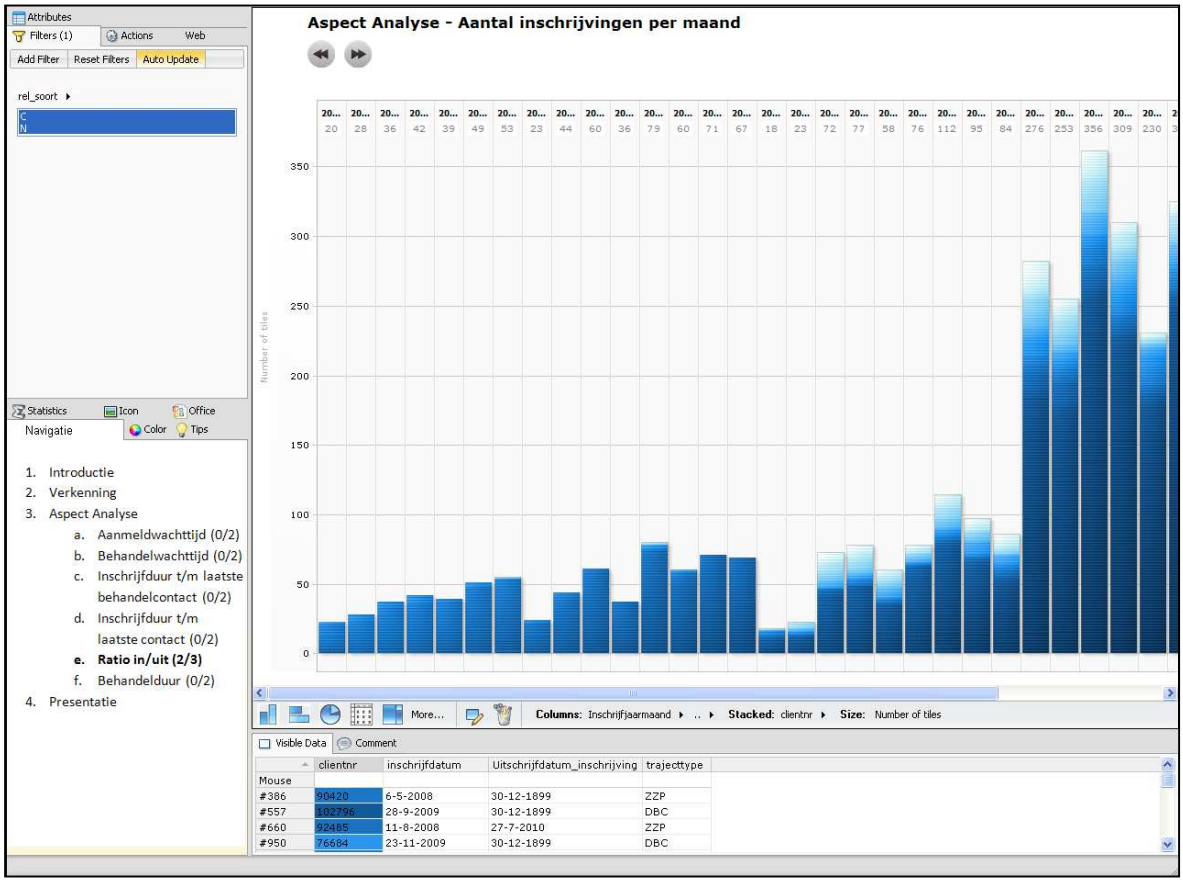

Figure 4-6 A detail-view of a KPI in MagnaView PAS

The location of the end user is always shown in the view name: '*high level location – detailed location*'.

4.3 Conclusion

The complete method of the end user is incorporated in MagnaView PAS, only the focus was on the navigation part and the details in analyzing the aspects are missing. Several details can be developed, especially in presenting extra information to the end user, when this is needed. A suggestion is: show text about what to do after each step or a help button, which could suggest a next step to perform. In order to do this all in this research project, significant experience of MagnaView is required. Since the required experience was not available, the implementation of the BA experience in MagnaView PAS was limited and a demarcation of the details was necessary. A first (beta) version of the tool has been developed. However, in order to come up with a complete tool more available time for this project was needed.

5. Validation

The validation of the project is discussed in this chapter. The results of this project are tested by user tests and will be discussed in paragraph 5.2. The first paragraph discusses the implementation of a dataset, which is used for the user test and also during the incorporation of the navigation part. The case study, which is the implementation of this dataset, is useful in assessing the operations of an end user.

5.1 Implementation

A dataset of the Geestelijke Gezondheidszorg Eindhoven (GGzE) will be applied during this research project for validation. Lizanne Pieters has done research into performance measurement in mental healthcare, especially for the GGzE. She carried out this research during her graduation project for the bachelor program Industrial Engineering for Healthcare at the TU/e. In her report she mentions a lot of useful references, and therefore it was easy to check what she has done and this made it useful for me to pick up some KPI's. One of her objectives was to deliver an overview of PI's and determine which of these PI's the KPI's are. The six sequenced KPI's which were supplied by the GGzE:

1. Admission waiting time
2. Treatment waiting time
3. Treatment duration
4. Ratio incoming / leaving patients
5. Resource occupancy level
6. No show percentage

The six identified KPI's are based on the literature and are discussed in Appendix C of this report.

5.2 User test

User tests are used to find out whether the developed navigation was indeed supporting the end-user in performing their analysis. The test is focused on the new version of PAS that supports the end user's process as described before. The sample size of 5 end users is relative small, but enough for a user test according to Jakob Nielsen. Elaborate usability tests are a waste of resources. The best results come from testing no more than five users and running as many small tests as you can afford (Virzi, 1992).

Initially, the user tests were planned to be conducted in groups, following the idea of a workshop. Conducting the tests in groups does not seem the best option, because it will be difficult to observe the actions of the end user. It is not possible to analyze the logs of MagnaView, according to the employees of MagnaView. Therefore it was decided to do the user test individually. Another advantage is the use of PAS, because now only one laptop is needed and it is not necessary to install MagnaView on the laptop of each end user.

The end users will be elaborated in the next section 'participants'. In order to be sure that every end user tests PAS in the same way, a method was designed and will be discussed in this paragraph. Hereafter the results will be discussed. And at the end a conclusion is stated.

Participants

It is desired to perform the user test with employees of the GGzE, only there was no availability of employees of the GGzE. Therefore Lizanne Pieters is invited to perform a user test. She is familiar with the process, because she performed her Bachelor endproject in cooperation with GGzE, as discussed in the previous paragraph. Lizanne is therefore rated as an employee (intern individual). It was hard to find more individuals, who already know the process. Patrick Riemers also performed the user test as an intern-individual, because he is the contactperson of MagnaView to the GGzE and is the only individual with pre-knowledge about the GGzE business process.

Table 5-1 Overview of the participants in the usertest

Name	Intern	Extern	Current function
Lizanne Pieters	✓		Master student OML
Patrick Riemers	✓		Project leader at MagnaView
Roel Kuijpers		✓	Project leader at Exere
Florian van der Wielen		✓	Master student IT
Willem van den Oever		✓	Distribution engineer at Philips

Method

Several questions are asked to the participants, some questions are related to the content, to measure if they are able to obtain some results. Other questions are asked to assess the navigation part of the end user. Ten questions are based on a likert scale (0=not at all, 2, 3, 4, 5=very) method and two are open. A set up of the user test form can be found in Appendix D. The next questions are asked on a likert scale method:

1. Is the purpose of the user test clear?
2. Is it clear where to start process analysis?
3. Is it clear how the GGzE is organized?
4. Is it clear which sequence analysis you ought to follow?
5. Do you understand the business process?
6. Do you know which steps you need to go through to achieve the desired outcome?
7. Is it clear which the most important aspects of the analysis are?
8. Is it clear on which aspects the GGzE performs sufficient and on which insufficient?
9. Is it clear how to analyze an aspect into more detail?
10. Would you recommend this tool to other organizations?

The two open questions are:

1. Is there financial data available?
2. Which are the KPI's of this business process? Which KPI's scores (in)sufficient?

Results

The scores of the results are visualized in table 5-2. The open questions were answered very well, only Florian answered the open question different from the others. Maybe he misunderstood the question or

otherwise he misunderstood the data. The question about the financial data was relatively easy, and everybody answered it correctly. Based on these questions the end users are able to perform process analysis, hence the answers to the open questions are reliable.

Table 5-2 Overview of the usertest results

Question	end user					Total	Average
	Patrick	Lizanne	Willem	Roel	Florian		
1.	4	5	5	4	2	20	4
2.	4	5	5	4	5	23	4,6
3.	2	4	4	4	4	18	3,6
4.	5	5	5	5	4	24	4,8
5.	3	3	4	3	2	15	3
6.	4	4	4	5	4	21	4,2
7.	4	5	4	4	5	22	4,4
8.	4	5	4	4	1	18	3,6
9.	4	5	4	4	4	21	4,2
10.	4	4	4	5	4	21	4,2

The results of the user test were positive. The end users are less familiar with the business process can be concluded out of the results, on questions 3, 5 and 8, here the average score is relative low. The questions related to navigation score high, 4,2 or higher.

Comments of the end users

- An information button would be useful, especially with a definition of the KPI's.
- The norm should also be visible in the detail views of a KPI. Only this is not always possible, because the norm is not directly applicable for all detailed views, but for some it would indeed be possible. E.g. a KPI is a ratio of two different variables, but the detail view only uses one variable. Then the norm could not be applied for that detail view. Roel even commented to introduce the norm into the graphs.
- More information about the data, mention the units in the views.
- Willem mentioned to link the organizational information to the discovery views. For that reason it will be clearer who is performing what and how it is organized.

Conclusion

Despite the fact that no real end users (employees) are used for the user tests, some results can be obtained. The end users were able to assess the business process. The results on the navigation related questions were positive. It can be concluded that the navigation is a success so far. The comments of the end users are useful and need to be kept in mind for future work. As mentioned before, it is better to test the new versions of MagnaView PAS multiple times with less end users, than a few times with a large sample size (Virzi, 1992).

6. Conclusion

In a final reflection on the total research project, the solution to the problem statement will be discussed, and in addition the limitation and reliability of the project. The future work is deduced from these sections and will be discussed in the last paragraph of this chapter. First the main research question (problem statement) of this project will be discussed. This problem has been solved to a large extent, because it is clarified how the experience of a BA can be incorporated in MagnaView PAS, which to a certain extent has been done and validated. With this new process analysis tool of MagnaView the applicability of data-driven process analysis in organizations is enhanced. An organization will be able to apply process analysis through of an employee, who has a limited technical knowledge, but is familiar with the process. The use of a BA will be redundant to a large extent.

To enable the end user to perform process analysis, the tool must suit the method of the end user. Therefore, actually, two factors are important to be incorporated in MagnaView. In the first place the aspects which were revealed in the interviews and secondly, the navigation for the end user.

The combination of those two factors is required to perform process analysis successfully. A single aspect is required to come up with a part of the results. But a correct selection and sequence of the aspects is required in order to combine the sub results into the desired overall results. The aspects can be seen as individual soccer players, the correct choice of individual players in combination with the correct position makes a great team. So the correct set of aspects in combination with the correct sequence of aspects makes process analysis successful. The navigation is required to guide the end user through his method of process analysis. In order to build the navigation, the key elements of the BA's method need to be structured. Structuring is possible by subdividing the method of the BA into different phases, hence the method becomes more transparent for the end user.

Now the problem statement of this project will be discussed by going through the 5 research questions.

- *RQ 1 – What method of working does an experienced business analyst use?*

Revealed in the interviews with experts, the process analysis method of a BA consists mainly of four phases:

1. *Getting acquainted with the business process,* this is mainly done by introductory conversations.
2. *Backing up the process knowledge with data,* during this phase the obtained information from the introductory conversations is checked through analyzing several aspects of the data.
3. *Identifying the problem of the business process*, this phase is based on analyzing the correct aspects.
4. *Presenting the results,* the connecting thread of the results is presented to the management board.

Phase 3 is the most extensive phase of the method of a BA. Interviews showed that several core aspects are interesting for this phase. These aspects are:

- Transformation of data
- Patterns (activities)
- Employees
- Financial
- Performance indicators
- Remarkable situations
- Time
- Efficiency and effectiveness

An experienced BA knows exactly which aspects are most important to analyze, how to analyze these aspects and in what order. The importance of an aspect depends on the industry in which the process analysis is performed. The exact order of the analysis is shown in Figure 2-3. The analysis and selection of the correct aspects is more complex as discussed in this research project, but depends mainly on the type of industry. Therefore it was decided to make MagnaView PAS industry specific.

- *RQ 2 – During which phases of the method (RQ1) is data available?*

While analyzing the aspects data is available. Data is required during the second and third phase of the process analysis method.

- *RQ 3 – What are the key elements of process analysis?*

The key element of process analysis is the experience of the BA. Because of this experience, he knows which aspects are important and in what order these aspects should be analyzed. Especially the latter is an important element which makes process analysis for a non-BA very difficult. A BA performs the analysis intuitively, where a non-BA would get lost because of the amount of information that is shown. Based on this information it was decided to incorporate navigation in MagnaView PAS.

Less important characteristics of a BA are:

    - Distinguishing facts from political interests during the introductory conversations
    - Identifying the correct data for analysis, in consultation with the process owner
    - Easily detecting skewed ratios of the business process, based on the first data scan or first conversations
- *RQ 4 – How can the output of the preceding research questions be translated into a technical solution?*

In general, MagnaView is the ideal tool to semi-automate this process, because it is already user-friendly. However, in order to translate the output of the preceding research questions into a technical solution, first of all the method of the BA needs to be more transparent for the end user. Therefore it

was decided to subdivide the method of the BA in 4 phases, namely: introduction, discovery, aspect analysis and presentation. The most important phase is the third phase (aspect analysis), because that is where the performance of the business process is determined here.

It is important to incorporate navigation into the tool, because otherwise the end user will get lost during the performance of process analysis. The method of the BA has to be made more transparent in order to apply navigation. The navigation part is incorporated in PAS, such as the core aspects for mental healthcare.

After making the method of the BA more transparent, the correct aspects revealed in the interviews have been incorporated into MagnaView PAS. The selection of the correct aspects depends on several factors, but mainly on the type of industry. Therefore it is necessary to make MagnaView PAS industry specific. The end user is not able to set the correct KPI's (subdivision of an aspect) and therefore a BA is still required to set KPI's for each industry.

This all let to a first version of MagnaView PAS and has a strong foundation for development to a second version.

- *RQ 5 – Is an end user able to quickly and easily perform a process analysis through MagnaView PAS?*

This was tested through user tests and the results are positive. Through demarcation of the project the method of the end user is not incorporated in detail, so the user tests were basically tested on the navigation part.

Limitation

Limitations of the project are mainly the demarcations made during the project. A solution to these limitations will be discussed in last section 'future work'.

- The tool is industry specific and not completely generic. This decision was well considered and deduced from the interviews. The case study during this project was applied with a GGzE dataset from the healthcare industry. Ideally the other industries should also be applied in a case study and validated by user tests.
- The incorporation of the end user's method into MagnaView PAS is done for the navigation factor. The method is therefore incorporated as a whole, but not in detail.
- The transformation aspect of the BA's method is left out. This aspect is also known as the Extract, Transformation and Load (ETL) step in the Business Intelligence area. This aspect is too complex for this project and therefore it is assumed that the data quality is sufficient.
- One of the core aspects of the BA's method is setting the correct KPI's. This has to be done once for every industry, but also in the method for the end user the BA has to set the KPI's. The end user is simply not able to set the correct KPI's, because his technical knowledge is too limited.

A general limitation of this project were resources and time, hence this research project was performed individually in 6 months' time. A limitation based on the research method was the lack of experience with MagnaView in combination with the time set. Extra resources could have been a solution to this limitation. It took valuable time to understand a sufficient level of the MagnaView tool. This experience was needed to incorporate the end user's method into MagnaView PAS smoothly.

Reliability

The reliability of the research can be heightened by support of several sources. The process analysis method of the end user is reliable, but due to the input of information and limited validation, some limitations on the reliability are present:

- The BA's method was based on interviews with 5 experts in the field of data-driven process analysis. All of the 5 experts are connected to the TU/e, which reduces the reliability to a certain extent. To deal with this limited reliability, the method was validated by an expert, whose origin was the Neyenrode Universiteit. Also not all of the aspects of the BA's method were supported by scientific papers.
- The method of the end user was only checked for the (mental) healthcare industry, which makes it somewhat less reliable as a generic process analysis tool.
- The demarcation of the problem, such as described in the Ishikawa diagram was based on information given by MagnaView. MagnaView came up with the assignment for this research project, which influences the reliability and actually this needs to be backed up by journal papers.
- No real end users have been used during the validation of the project, because no employees of the GGzE were available for this user test. This was solved by using two individuals, who already know the business process and could be classified as 'end users'.

Future work

Some future work can be done with respect to the limitations and reliability of this project. Not everything can be researched into detail in one project and therefore this section is devoted to future work. The future work is bulleted below:

- Supplement MagnaView PAS by performing a case study for each industry. For each industry the correct selection and ranking of aspects is the most important adaptation.
- The transformation of data, also known as ETL in the area of business intelligence, needs to be researched. A research into the data quality of process data can be a graduation project in itself.
- All aspects could be researched and implemented in greater detail in order to complete the MagnaView PAS tool. Mostly they are more complex as was illustrated in this project.
- With an information button regarding the main target of the organization the definition can be showed, but also the value of remembering it in the introduction phase. The value is to let the end user draw attention to the overall goal of the organization and to point out that this goal can be contradictory to the goal of the business process. Following Rob Kenens, who validated the BA's method, this needed to be pointed out more.

- Other details, such as information buttons can be added to MagnaView PAS, but these details will develop automatically during the several user tests and case studies. See the comments of the user tests as an example. It is important to keep the tool well arranged in order to smoothly navigate the end user through his method.

A general rule, to be recommended is to apply the user tests of the tool several times, because it is better to test the tool multiple times with a small sample size, than test it less frequently with a larger sample size (Virzi, 1992).

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Glossary

Attribute	An attribute, or data field, is a part of a record. (E.-J. van der Linden, et.al., 2010)
Business Analyst:	An (internal) consultancy role that has responsibility for investigating business systems, identifying options for improving business systems and bridging the needs of the business with the use of IT. (D. Paul, Y. Donald, H. Keith, 2006)
BPM	Supporting business processes using methods, techniques and software to design, enact, control and analyze operational processes involving humans, organizations, applications, documents and other sources of information. (M. Weske, W.M.P. van der Aalst, H.M.W. Verbeek, 2004)
Business process	Business processes have two important characteristics, namely; it has customers and it crosses organizational boundaries. (T.H. Davenport, J.E. Short, 1990)
Confounded	Variables are confounded if they vary together, so that it is impossible to determine which variable was responsible for observed effects.
Data analyst:	is a specialized type of BA whose focus of analysis relates to data.
Dataset	The dataset is the set of records extracted from the data source. (E.-J. van der Linden, et.al., 2010)
Employee	An internal individual, who is familiar with the organization and business process, but has limited technical knowledge.
End user	A non-BA, which is inexperienced in the field of process analysis, but is familiar with the business process. The end user will perform process analysis by using the MagnaView PAS tool. Normally the end user is an employee of the organization which performs process analysis.
GGzE	Geestelijke Gezondheidszorg Eindhoven (Dutch); Mental Healthcare Eindhoven
KPI	The Key Performance Indicators (KPI's) are seen as the minimum set of PI's needed to monitor an organization's performance in terms of goal accomplishment. A (K)PI therefore consists of two parts: how to measure the performance and the control limits which the actual measured performance should be within (S. Flapper, et.al., 2009).
Likert-scale items	Rating on a continuum, such as from "strongly agree" to "strongly disagree".
MagnaView PAS	The half-automated data-driven process analysis tool of MagnaView. The aim of the PAS tool is to enable an End user to obtain quickly and easily insight into the business processes of an organization.

Performance management:	involves the use of systematic methods for monitoring and managing and organisations's performance, but also involves the capability of an organization to provide relevant information for decisions on future performances (I. Baars, et.al., 2010)
Process analyst:	is the title that is typically used to describe a specialized type of BA that is focused on the analysis of processes.
Qualitative data:	defines output in terms of quality, such as is done in words.
Quantitative data:	defines output on a numerical scale.
Non-BA	see End user.
Record	A record is a part of a dataset with a value each of the attributes in the dataset. (E.-J. van der Linden, M. Wijffelaars, J. Samuels, 2010)
Validity	In general, validity refers to the methodological and/or conceptual soundness of research.
Variable	Any characteristic that can take on different values.
View	A graphical presentation of the dataset and contains a selection of the attributes and records. The view is what the user eventually sees and experiences. (E.-J. van der Linden, et.al., 2010)

Abbreviations

BA	Business Analyst
BI	Business Intelligence
BPM	Business Process Management
BPI	Business Process Improvement
BPS	Business Problem Solving
CIO	Congress of Industrial Organizations
CRM	Customer Relationship Management
ETL	Extract, Transform and Load
EU	End User
GGzE	Geestelijke Gezondheidszorg Eindhoven (Dutch)
HRM	Human Resource Management
MT	Master Thesis
MV	MagnaView
IS	Information Systems
IT	Information Technology
KPI	Key Performance Indicator
OML	Operations Management & Logistics
non-BA	non-Business Analyst
PAS	Process Analysis Suite
PI	Performance Indicator
RQ	Research Question
ROI	Return on Investment
TU/e	Eindhoven University of Technology
VSM	Value Stream Measure

Appendix A: Interview set-up

This appendix shows the set-up of the interviews, as indicated in chapter 2. First the interviewees will be introduced to the research project and the reason of the interview. Secondly they will be asked to explain some of their projects which they have recently done. If they do not have any or just do not want to talk about (confidential or pledge of secrecy) , than an imaginary case will be stated. That (imaginary) project will be used to relate the questions to practice and to support the answers with practical examples.

The questions are approved by MagnaView and are set up in such a way that the questions are stated by subject. Some questions are introducing, others are about the difficulties and others will only be related to the data of the analysis. The most important questions (with the most valuable answers to the research) are asked twice in order to increase the chance of a complete answer. Of course the second question is asked in another way, through the use of other words or even another context. The questions at the end seems hard to answer, but can be seen as an extra and those possible answers can be valuable to me. Below is the exact interview set-up as I had in front of me, during the interview. For clarity, the interviewee did not have this set-up.

Introduction

The aim of this interview is to reproduce and map the way of working (way of thinking) of an experienced BA. The BA possesses knowledge/experience, which is required to perform process analysis. The goal is to extract the experience out of a BA and incorporate it into the MagnaView PAS tool, in order to produce an intelligent process analysis tool. With an intelligent process analysis tool the usability of PAS will increase. A high usability is desired by MagnaView and will lead to extra licenses.

Through these interviews I want to obtain the core line of reasoning and thinking during the analysis of business processes.

Case

You start with a huge amount of data and a visualization tool. What do you want to visualize? What do you want to conclude? How will you reach these conclusions? Which information do you want to obtain without the data?

First I will ask some introductory questions and after that I will ask the questions into more detail. The sequence of steps and data are the main subjects of the interview. Questions asked when interviewing the experts: *(Keep on asking what the core idea behind the method is and how it is used.)*

- Do you have any questions in advance?
- Name:
- Tel:
- Company:
- Function:
- Years of experience:

- Recent process analysis assignment/order: (what kind of process is it?)

Process analysis method

- Which method or management fashion will you use normally? Which thoughts are underlying it?
- Which steps are performed during an analysis? What is the First step? A check or do you adapt the data or..?
- Is the sequence of steps important? Casu quo are the steps dependent on each other? Which are essential? Are there important decision points, which lead directly to another conclusion?
- Which steps are standardized? Are there routine analyses or are they always different? (percentage, to get a global idea)
- Are there steps, which you perform, without the use of data? Do you perform them in advance or after a certain step?
- *Possibly:* Which tool do you use? Which functions do you use the most? Which function is essential or very effective?

Data

- How did you get to the data, which you used for that task? ERP system, self obtained?
- What kind of data do you use? (*activities, timestamps)* Do you need to adapt the data, before you analyse them?
- What did you measured with that data?
- Do you make use of KPI's? How? Do you search for KPI's or are they given in the problemcontext/ objective of the task? Or are you looking for PI's and determine your own KPI?
- Which situation, objective, target, input (incomplete/complex data, goal) ask for problems in advance?

- What do you want to conclude after process analysis? How do you want to present your results to the process owner? Do they understand the output of the tool or do you need to adapt the output?
- Do you get stuck (deadlock, jammed) sometimes? If so, on what steps/points? Which steps take a lot of time? (*transform data?*)
- If you think of process analysis in general? What is the most essential part of the analysis? (e.g., *correct data, clear problem definition)(a bit of a broad question)*

- Do you think that an inexperienced person can perform a process analysis? Why? (Current or new version)

- Thanks for your time and willingness! Do you want to participate in a possible workshop or usertest that I want to hold with experts? Probably it will take 30 minutes, may I contact you for that?

Appendix B: Interviews

Summary Interview Reinder Graveland

23-03-2011

Reinder Graveland has been working as a management consultant at Spartners in Nuenen for three years. He is mainly occupied with the improvement of production and logistics processes. Reinder graduated cum laude from the Operations Management & Logistics study at the Eindhoven University of Technology.

Within Spartners they use Lean manufacturing, which means that they are customer focused. The value added activities will be promoted and the other activities will be limited. This results in a customer focused process which the customers are willing to pay for. Spartners does not use process mining.

Method
The first step of process analysis is to look at the organization within the company. The main aspects of an organization to be investigated are the ratios of personnel and the financial flow by department. Income and expenditures are important factors for your instinctive feeling of the situation. From that information a lot can be inferred, but experience helps tremendously to see skewed ratios.

The second step is obtaining the data, checking if the company already has the necessary data, otherwise retrieve the data throughout measuring. If the data is in your possession, a brief data exploration follows. The structure of the company needs to be figured out, especially in the manufacturing department, but also other departments especially when you think the problem lies there. Subsequently a Value Stream Mapping (VSM) will be produced. The VSM shows the steps in the business process and the relations between them. After the data is viewed in general, the problem area will be viewed in more detail. If the problem is in two separate sections, then the analysis will be split and analyzed as two separate projects.

The employees of a department, who perform the same activities, will be judged as one type. In the beginning it is simply too detailed and too difficult to distinguish between them. You do not have a clear idea of what each employee is doing, maybe they have other activities or are part-timers, etc. If you think that the problem is one of the employees, you can zoom into that at a later point in time. This can also be seen as a new project.

KPI's are generated to show the improvement of a business process, they are not known in advance by the company. KPI's are also used as a performance measure for the consultant. Each section has its own KPI's and the KPI's of logistics differ significantly from the KPI's of a production department. In a production department you look at the efficiency, not at the effectiveness, because you look at the time which is spent on the activities. You cannot directly see if something can be produced twice as fast. The entrepreneur is more interested in the overall performance, normally this is not a KPI, as there are many factors involved.

The results will be presented to the customer through figures or tables in Microsoft Powerpoint. Often a graphic image is created from a Microsoft Excel pivot table. You present what you found and what possible improvements they can apply in the future. The results are often presented in a simplified way to the entrepreneur.

ROI
In practice, the ROI (Return on Investment) is an important factor. This needs to be translated carefully. Especially for financial investments the ROI is important. In the end, this needs to result in higher profits. The ROI can be reasoned in an economicaly way or in a practical way, clearly distinguish between them. Think of taxes and/or reality.

Data
The data is not always completely provided by the company, e.g. when there is no data on production times, then Reinder will measure it himself. The activities are measured by Multi Moment Opname (MMO).

Problems
Individuals within the company are usually the problem, in particular their political interests. Especially in large companies, political interests play an important and annoying role in process analysis. That is very often the reason that things do not succeed. Whether the analysis is successful, usually depends on the people in the organization itself. Objective data is important.

You need experience to assess individuals correctly, because you can get stuck here. In order to execute the project correctly the entrepreneur needs to dare give up some control, otherwise this needs to be raised.

The analyzing phase normally takes 3 days, without measuring any data, because this easily takes a week. The implementation phase depends a lot on the project, this differs from 3 days till a few months, 1 day a month. On average it takes 10 to 15 days and you perform such a project on your own.

Important factors

- The first conversation; assess the individuals.
- ROI
- Objective data, be sure that the information of the individuals are facts.
- Gain specific information about the process, know what to improve. Initially do not focus on employees, this can be analyzed at a later stage.

Feasibility of the Master Thesis

The problem for a non-business analyst is to decide which part of the data has to be analyzed more specifically. Probably it is too ambitious to let the end user perform all of the process analysis projects, but 50% should be doable. In practice PAS should be a useful product. Also a collaboration of MagnaView and Spartners in the future should be possible with a tool like PAS. A interesting feature of PAS would be a function to look at the ROI, it should be profitable to implement that improvement. The ROI should be based on the business economy in practice, not on the numbers of an accountant.

Summary Interview Ronny Mans

28-03-2011

Ronny Mans is taking his PhD in Process Mining at the Eindhoven University of Technology. He has had six years of experience doing process analysis.

Ronny is presented with projects through the University and normally these take place in the healthcare industry. He needs to show, in a scientific way, if process mining is possible at that hospital or other institution. So, his projects are scientifically reasoned and not in a management way. Mostly his projects are not problem driven and do not aim to enhance the performance, but are purely focused on proving the applicability of process mining. Therefore not all of the questions are applicable to his projects and some questions he answered are separated from his projects. The focus is on the way he analyzes the processes. Therefore his scientific background is sufficient to qualify as expert.

Method

Actually you need to know in advance what is going on in that company. Some domain knowledge is desired, it helps you to explore your data.

Process analysis is always performed with a target and sometimes the client has a specific question. When the client has a specific question, still first the company overall needs to be checked if nothing out of the ordinary is going on. Because when something strange is going on and the process analysis is started without considering it, this may lead to strange results.

Firstly the data needs to be converted into a log. During the conversion a proper idea is created of the situation. Is the data as expected, what is in the data, are there patterns? One of Ronny's first views is a dotted chart, which is similar to a Gannt chart. To produce a dotted chart timestamps are required. The basic idea of a dotted chart is to plot dots according to the time. When Ronny has not enough knowledge about that process, he performs some interviews with the process owner to obtain the required knowledge. If he has enough information and enough data (complete and qualitatively sufficient), he imports it into Prom to generate a workflow model and/or a dotted chart. With the MagnaView PAS tool it would also be possible to produce useful visualizations of the data. Ronny thinks that proper visualization is needed. Nevertheless Ronny wants to figure out the frequency of each pattern.

When the different patterns are clear, the data will be filtered on outliers or specific information, which is not needed. This is a cycle of preprocessing. Different levels of aggregation will be brought at the same level.

Summary Interview Martijn Wijffelaars

29-03-2011

Martijn Wijffelaars has been employed at MagnaView as a data-analyst and developer for three years. He has graduated as an IT specialist at the Eindhoven University of Technology. Martijn is responsible for the MagnaView CumLaude package. CumLaude is an information visualization package for secondary schools.

During this interview other questions were asked to explore the core of Martijns' activities during an analysis, since Martijn is a data analyst and not a process analyst. Data analysis is part of process analysis, therefore his input can probably be a useful contribution to the research.

Simac is a partner of MagnaView and is doing the sales for the CumLaude package. Normally a training is given by Simac, but sometimes Martijn also gives trainings at secondary schools. The training is intended for the personnel of a secondary school, so that they can work with CumLaude on their own. Simac normally also provides the administrations systems (SOM) and the @VO databases at secondary schools.

A recent project of Martijn was carried out at a secondary school of the CVO group. This school didn't meet all the criteria, set by the government. Each year all the secondary schools are compared to each other and the CVO group in Driebergen scored nationwide at the lowest 12,5%. Through MagnaView CumLaude, that school got better insight into their problems. Now, they implemented some improvements and recently they scored on average, which shows good progression. Usually the projects of Martijn are fairly short.

When a secondary school does not perform properly, someone within the organisation will try to solve the problems. Such a person is going to work with Microsoft Excell to get insight into the problem. They contact MagnaView when they get stuck and asks whether their excel file can be reproduced in MagnaView. Obviously this is possible, but normally that would not satisfy the performance problem. With the expertise of Martijn and the features of Cumlaude new views of the data will be generated. This leads to a good insight in their data and performances. The overall goal of Martijn is to show how well and easily CumLaude can be used to get insight into your performances. Hopefully these schools purchase CumLaude for themselves.

The difficulty is to convince people who have already spent time on that problem. Mostly, their approach (produced excel file) is not satisfying their desires and you will have to convince them to improve their way of thinking. Mostly, those people are opinionated and have no feeling of satisfaction when their work is rejected. This is human nature and understandable. During process analysis the

people will be less opinionated, because they are more convinced that they do not have a good solution to enhance their performance.

Method
In a first meeting it is important what clients want, and whether the required data is also available. The aim of this first step is to obtain as much information as possible in a relatively short time. What is the problem, are there other relative aspects? Here you also try to look beyond the problem itself.

The second step is checking the data and searching for specific data. Between the first and second step, Martijn already thought about his results and which views he wants to generate. Building the reports is often exploratory and usually it becomes clear that the data needs to be adapted or cleaned up.

The final step is to present the client specific solution. This is rarely or never modified or simplified, since the employees of that secondary school have to work with MagnaView CumLaude on their own.

Data
At first glance the data always looks good, but afterwards several problems will occur due to the quality of the data. Sometimes you find this out quickly, but at other times this happens later in the process; it depends on the clearness of the data. Also the introductory conversations can be too limited and lead to questions about the data at a later stage. If there are any problems with the data you have to ask the concerned employees for explanation or the administrator for other data. Normally, the data comes from a SQL database. The better the quality of the data, the easier it will be to visualize.

Important factors:

- The quality of the data plays an important role in the analysis
- The first meeting is important. Because a correct estimate of the whole situation and problem is important. Also the estimation of what people really want is useful to obtain proper results

Summary Interview Anne Rozinat

30-03-2011

Anne Rozinat is a software engineer and took her doctoral degree in process mining. She started Fluxicon (together with Christian W. Günther) to create process mining solutions for professionals. Now she has about 10 years of experience in the field of process analysis.

Anne thinks that the target of the process analysis depends on the type of industry, because each process type has its own characteristics. In general the manufacturing industry is well engineered and normally asks for optimization, but service and healthcare are completely different worlds. Normally she conducts process mining projects in the service industry, e.g. a call centre, but she is not able to go into detail about her projects, due to confidentiality.

A process analysis is mainly performance or quality oriented. Performance oriented projects normally have two main aspects, namely time and money. These two aspects are nearly always related. The goal

is to reduce these to a minimum. The quality aspect also has to do with the satisfaction level of the clients, which is important in the service industry.

Method
At a high level, the method of Anne consists of four steps. The first step can be seen as an introduction into the problem and complete process. During the second step the data will be checked. In the third step, the process data will be analyzed through process mining. The last step is preparing the visualizations for the presentation to the process owner.

Below are the steps summarized and enumerated;

1. Interviews
2. Data check
3. Data analysis
4. Presentation

The first step performed by Anne is gaining general business information through conversations with the customer, process owner or internal process analyst. Understanding the processes, identifying the questions and gaining some domain knowledge are the targets of these first conversations. (Keep in mind that these questions will be different for the several types of industry, such as service, manufacturing or healthcare.)

The second step is checking the data, for which process data is required, which is retrieved from the company. Together with the administrators it is decide which data is needed and they will send the correct data. Depending on the company, the data is extracted from several information systems. The data will be scanned for completeness, at the same time your understanding (perception) of the business process is checked. If some questions arise during the first data scans, this means that your first conversations were too limited. You need to contact those interviewees again to answer your questions about the data.

The data will also be cleaned, sometimes this a time consuming step. During this part of the analysis some new question may arise. To answer them some specific domain knowledge is needed. When a process analysis gets stuck, normally it will be in this section, but this cannot be judged in advance. The main reasons to get stuck are a lack of domain knowledge or incomplete data.

The third step can be started if the data is cleaned up and the process with the accompanied questions are known and understood. Normally, you have some potential views in mind. At this point, you have to decide where to start and which steps you would like to perform. Normally you follow different routes, produce different views and try several ideas of improvement. The cost-benefit analysis is the basis for making the right decisions; this is also called change management.

The fourth step is presenting the results to the customer. Normally, the results are simplified and, depending on the questions, visualized as a chart, table, list or picture. The aim is to show the customer

the core of the problem with the accompanying results in a simplified way. The customer needs to understand it. Of course it needs to be complete. It may only be simplified by leaving out irrelevant or less important issues.

Data
After a discussion the right data will be delivered by the administrator of the company. Anne never has to extract the data for herself. The data is always domain specific and needs to be cleaned. It is hard to judge the quality of the data in advance. But sometimes the data can lead to analysis problems.

The most important ingredients for a satisfactory process analysis:

- Willingness of the company; people who are trying to help you.
- Domain knowledge, employees of the company needs to be willing to help you.
- Complete data

An experienced BA is able to quickly gain the right domain knowledge. This domain knowledge is necessary to understand the data and get insight into business processes, also to understand the real problem. Normally this information is gained during the first conversations with the company. And a BA is able to subtract this information easily from a few conversations, if the people are willing to help.

Remarks
Anne mentioned that it is an ambitious project and she has strong interests in the result of this project.

Summary Interview Robert de Groot

05-04-2011

Robert de Groot works as an IT auditor and consultant at KPMG. Previous to that he took the Master study Operations Management & Logistics at the Eindhoven University of Technology. Now he has three years of experience with process analysis. The consultant projects of Robert take place in the area of process analysis. Audit projects are based on process analysis, but are no real process analysis. Robert is mainly focusing on the financial processes in a company. Normally he gathers data out of PAS. The main problem comes from poorly kept records, this ensures that the data is dirty.

Method

Firstly, some conversations take place to get introduced to the domain. The knowledge about the domain consists of the company structure and business process. Normally you only look at a part of the business process, so also specific process knowledge is required to understand that part. Some companies, who use SAP, have compilationdocuments, which can be used to get the required domain knowledge. Compilationdocuments will save time, because fewer interviews are needed.

The second main step, is checking the data. Did you really receive the data, as was agreed during the preceding conversations? Automatically you are checking your domain knowledge. This will be done as

soon as possible, so if there are any questions you can ask them to the company (relevant employee) and you will receive your answers in a short time scope. This minimizes the risk of delay.

When the data is checked, it is possible that some small manipulations are needed before analysis. The details of the steps hereafter are project related, they differ a lot from each other, because in each project other results are to be obtained. Robert gains insight into the business processes by plotting graphs. A sort of process mining is applied, but not like ProM, because no workflow model is produced. Actually, he wants to see which percentage takes which path. Actually you want to see the process beaten flat into a table. For example, when you have a value in box A and a certain value in box B, than box C has 3 potential answers. If box C includes another answer, that is what you want to report.

You have to join the unique boxes of a table, but finding the unique points is difficult.

By presenting the results to the management board, you only present the main lines, not the details. Dynamic reporting is used in ways like pivot tables with filtering.

Problems

The data can lead to problems, e.g. when the data is incomplete. Other problems with the data, such as misunderstanding, can be prevented during the orientation conversations. Interviewing the right people and asking the right question can prevent misunderstanding. The company is also responsible for it, so misunderstanding cannot always be blamed on the BA.

Appendix C: KPI's GGzE

This appendix shows the KPI's as they are set by the GGzE. These KPI's are used in the dataset, which is used during the user test. The KPI's are listed below and more elaborated in the paragraphs below.

Mental Healthcare

The need for mental healthcare in the Netherlands is increasing. In 2001, 535.000 clients received treatment by mental healthcare excluding the clients of forensic- and addiction care. In 2007 this number had increased to 845.000 clients, which is a growth of nearly 10% per year. It is expected is that this number keeps increasing over the next years (GGZ, 2009). To be able to meet this demand, improvements in business processes is needed. GGzE is a service provider in mental healthcare that aims to treat patients as effectively and efficiently as possible. Therefore GGzE is continuously trying to improve their processes in terms of quality, time and costs. One of the ambitions they formulated is to gain better insight in the demand and results of their processes (GGzE, 2009).

1. Admission waiting time
2. Treatment waiting time
3. Treatment duration
4. Ratio incoming / leaving patients
5. Resource occupancy level
6. No show percentage

Admission- and treatment waiting time

The first two KPI's "Admission waiting time" and "Treatment waiting time" are selected from the set of PI's. (Zichtbare Zorg GGZ, 2009) Minimizing these KPI's is important for the satisfaction of the patient. The admission waiting time gives important information about the responsiveness of the system. This waiting time is needed to determine whether the client can and should be treated by GGzE. The treatment waiting time represents the time needed to diagnose the client. These waiting times can increase if the resource occupancy level is high.

Treatment duration

The KPI "Treatment duration" is derived from the PI "Throughput time" (J. Bertrand, J. Wortmann, J. Wijngaard, 1990) which comprises the total time to treat a patient. However, dividing this PI into three different time spans; admission waiting time, treatment waiting time and treatment duration provides more information. Since mental healthcare treatments can comprise a long time span, it would be interesting to see how this differs for different centers, groups or even care programs.

Ratio incoming / leaving patients

The KPI "Ratio incoming/leaving patients" is formulated to be able to monitor the balance of the system, i.e. whether the number of incoming patients is equal to the number of leaving patients per period. An incoming patient is a patient with an intake appointment and a leaving patient is a patient who gets signed out. The system is in balance when the ratio equals one; in that case the number of incoming

patients is equal to the number of leaving patients. A ratio higher than one indicates that more patients are taken in, than leaving. In that case, 'blocking' occurs and waitinglists and waitingtimes will keep increasing. A ratio lower than one indicates that more patients are leaving the system than coming in. Then starvation is taking place, which in the long term will cause exodus. (Bertrand, Wortmann, Wijngaard, 1998) It is also possible to measure this ratio for the total process, in that case the application or registration date could be used instead of the intake date. However, since the treatment duration seems to be the bottleneck, here it is chosen to only focus on the treatment process.

Resource occupancy level

The percentage of time which a certain resource is, directly or indirectly, occupied by patients, will be a KPI. This KPI is called; "Resource occupancy level" and is named in the book of Bertrand, Wortmann and Wijngaard (1990). For measurement of this KPI, the available units per period for each resource (employee, bed, tools, etc.) should be known. In case of employee occupancy, the resource units will be full time equivalent. The higher the resource occupancy level, the longer the waiting and treatment times will become.

No-show percentage

The last KPI "no-show percentage" is mentioned in literature as 'number of no-shows'. This KPI describes the percentage of all appointments at which clients were not present without cancelling the appointment at least 24 hours in advance. This KPI is aimed at measuring the efficiency of the care process. The lower the No-show percentage, the less time of care providers gets wasted and the more care can be provided with the same amount of resources.

Appendix D: Usertest

This form was used for the usertest and set up in advance to test the 'navigation' of the end user. This form was approved by MagnaView.

Naam:.....

Vraag	Oordeel: Omcirkel wat van toepassing is.				
	Helemaal niet	**Niet erg**	**Geen mening**	**Enigszins**	**Erg**
Is het nut van de usertest duidelijk?	1	2	3	4	5
Is het duidelijk…					
waar je moet beginnen met analyseren?	1	2	3	4	5
hoe de GGzE organisatorisch in elkaar zit?	1	2	3	4	5
welke volgorde van analyse je hoort te volgen?	1	2	3	4	5
hoe het bedrijfsproces in elkaar steekt?	1	2	3	4	5
welke stappen je moet doorlopen om de gewenste resultaten te krijgen?	1	2	3	4	5
wat de belangrijkste aspecten van de analyse zijn?	1	2	3	4	5
op welke aspecten (KPI's) de GGzE voldoende scoort en welke onvoldoende?	1	2	3	4	5
hoe je een KPI in meer detail kunt bekijken?	1	2	3	4	5
Is er financiële data aanwezig?	ja			nee	
Wat zijn de KPI's van dit bedrijfsproces? Welke KPI's scoren (on)voldoende?	....				
Zou je dit programma aan andere bedrijven aanraden?	1	2	3	4	5

Opmerkingen/aanbevelingen:

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