Best Practice in Auditing HSEQ Management Systems of Petroleum E&P Companies

Master's thesis

by

Thomas Reinhard Neuhold

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at the

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AFFIDAVIT

I declare in lieu of oath that I wrote this thesis on my own and performed the associated research myself, using only literature cited in this volume.

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(Thomas Reinhard Neuhold)

Leoben, the 04.03.2008

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Contents

1 Introduction

1.1 Objective of Study

In the last years OMV has expanded into several new business sectors. This growth included the merger and acquisition with other companies, like Petrom in Romania. Due to this expansion, the OMV now belongs to the middle class international companies and has become one of the larger oil and gas producing companies in Europe.

In a competitive environment like the energy market in Europe and especially in the eastern regions of Europe, a company needs functioning management systems for their business units, to ensure, that every part of the company is working towards the strategic targets of the company. Since the management system in the HSEQ division of OMV E&P GmbH was once designed for a much smaller company, it is important to find out if this system is still up to date.

In the HSEQ management system, the auditing was restructured some time ago, but without knowing how this is handled in other oil ad gas producing companies. Therefore the thesis at hand has the objective to compare the auditing methods used in the HSEQ department of OMV with other E&P companies.

With the aid of a survey the auditing habits of other international companies should be evaluated, and afterwards compared with the habits of OMV E&P. Additionally the auditing methods of OMV E&P were compared with the international standards.

1.2 Structure of Thesis

The thesis is structured in two parts. The first part contains the theoretical fundamentals, while the second part consists of the analysis of the survey.

The theoretical fundaments start with a description of the term management and management system. In this part, some basics about management and management systems are introduced, to give the reader an overview of this theme. After the definition, the management process is described with its different parts, to explain the underlying organization.

After describing the basics of management the controlling circle, which is an important part in the management, is explained, so that the path for the explanation of auditing can be done. As a main part of the thesis at hand, auditing is described by virtually conducting one audit from the very beginning to its end.

The chapter “Data Acquisition by Survey” deals with the different methods to gather information from other people. In this part, the structure of a survey is described, and different survey methods are explained with their pros and cons. Since the written survey was chosen for the survey done in this thesis, some additional information about the correct structuring of written questions is given.

In the practical part of this thesis, the survey and its analysis are described starting with the description of the creation of the questionnaire and the progress of the survey itself.

The most important part of this thesis is the analysis of the data collected by survey, as this was the objective. The analysis starts with a general overview of all the questions. In this overview, the result of every question is displayed graphically and these results are also explained in the text.

After the general analysis, a detailed analysis follows. For the detailed analysis, the companies surveyed have been divided into different groups, according to their number of employees, and the differences between the groups are worked out, for several important parts of the auditing process.

The last part of the analysis is the interpretation of the survey results opposed to OMV. This part contains the comparison between the survey results and OMV methods for auditing, and another comparison between OMV and the methods described in the ISO norms.

Finally the conclusion summarizes all the findings of this thesis, and gives some recommendations regarding the auditing methods of OMV.

2 Management

"More than two are a group and every third has a different goal…"
Reinhard Mey, lyrics

This short sentence gives a good view about the problems organizations and companies have to face, even if it still is rather optimistic. The problem is that each of us already has several different goals, which most of the time will compete with each other, so that we have to decide which of them we want to fulfill at a certain moment. Therefore if many people want to reach a common goal, it is important to organize the work needed for this task.

2.1 Definition of Management

"Management is the target based leadership of organizations or parts of them."[1]

Since the modern economy is a complex system, which contains lots of people and resources, organization is a very important factor to ensure the functionality of organizations and companies.

The term management can be used to mean two different things. First it can be used for an institution or group of people which include all the people possessing decision and ruling authority. According to their position in the hierarchy of an organization three different layers of management with different duties can be defined (see Fig. 1):[2]

- Top-management (board, business manager)
- Middle-management (plant manager, department manager)
- Lower-management (chief clerk, head-workman, foreman)

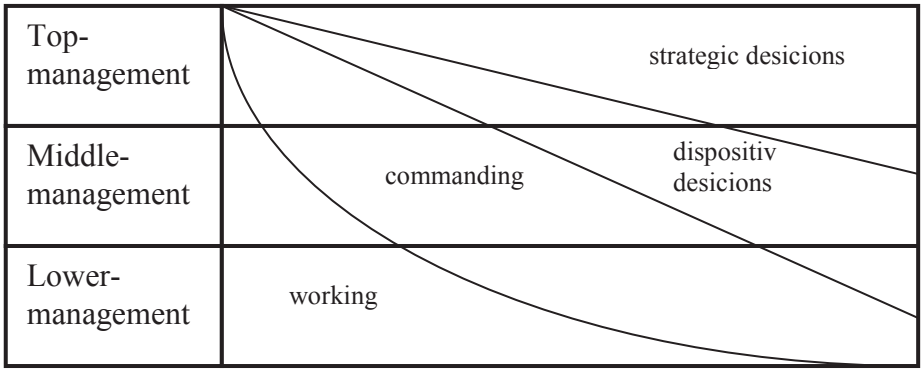

Fig. 1: Duties of High- Middle- and Lower-Management (Source: see Schierenbeck p. 81)

[1] Cit.: Holzbaur (2001), p. 25
[2] See: Schierenbeck (1995), p. 81

On the other hand management can also define a group of duties, which are needed to lead an organization or different formulated, all duties which are not solely working directly on the product.[3]

The three main tasks of management are:

- Configuration
- Guidance
- Development

This means, that configuration is used as a basis for the management and therefore enables the organization as a whole to survive by being able to develop. The second task is enabled by the definition of targets, which lead to the creation and bringing into action of measures. The last point, development, can on the one hand be seen as the result of the other two tasks over time, or on the other hand as a proactive process of learning.[4]

A company or organization is lead by decisions. Information is essential for making meaningful decisions, so the collection and aggregation of information is one of the secondary tasks of management. After a decision has been made, it must be brought into action and to find out if these changes in the workflow are useful, the results must be measured and evaluated. But since decisions can be seen as an act of defining a will, also the definition of targets can be seen as a decision to configure the mental structures of a company for the future.[5]

2.2 Management System

To explain what a management system is, first the term system should be introduced. In normal everyday business, the word system is normally connected to things like: computer system, solar system, communication system or business system. In some other cases, it is normally essential to include some specific explanations, to exactly define what is meant, like: the company, a social-technical-financial system or the pond, a biological system.[6]

[3] See: Holzbaur (2001), p. 25
[4] See: Pischon (1999), p. 96
[5] See: Holzbaur (2001), p. 26 et seq.
[6] See: Haberfellner (2002), p. 5

All of these different systems have one thing in common. They describe something, which can be divided into parts which are normally called elements. These elements do not stand alone, but interact with each other, sometimes in very complex ways (see Fig. 2). In the terms of system engineering these interactions are usually called connections, and together with the elements they form a group of interacting parts, which add up to something whole, which is then called the system.

The elements are the bricks of the system and are defined very globally, so that they could be fish in a pond, or departments in a company. Normally most of the elements can be seen as systems of their own, if it is needed to get a more detailed view. The connections between the elements are also defined very globally, so that they can be material flows, information flows or just influences between the elements.[7]

Since the human brain is rather restricted in the understanding of interconnected, complex systems the system border is used to limit the complexity of the system looked upon. The surrounding or environment contains other systems and elements, which are outside of the defined system boundary. Since in most cases the boundary of a system is seen as an open border, the surrounding can influence the system.[8]

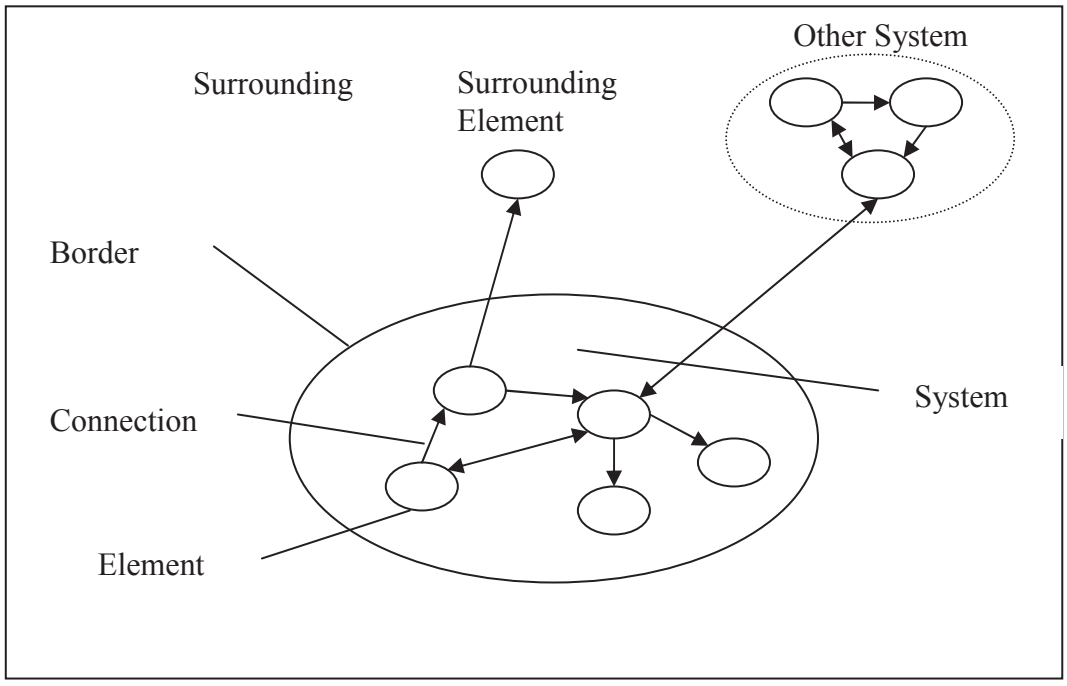

Fig. 2: Parts of a System (Source: see Haberfeller p. 5)

[7] See: Haberfellner (2002), p. 6
[8] See: Haberfellner (2002), p. 6

If the term system is used in connection with a management system, or a company, then the system will normally be structured in layers (see Fig. 3), of increasing level of detail. A company consists of many different elements (workers, raw materials, machinery, products, departments …) which are interconnected in very complex ways. These connections (material-, information-, energy-flows, social connections …) are very important to enable the functionality of the company. But also the surrounding is important for a company, because it contains the customers, suppliers and rivals, just to mention a few.[9]

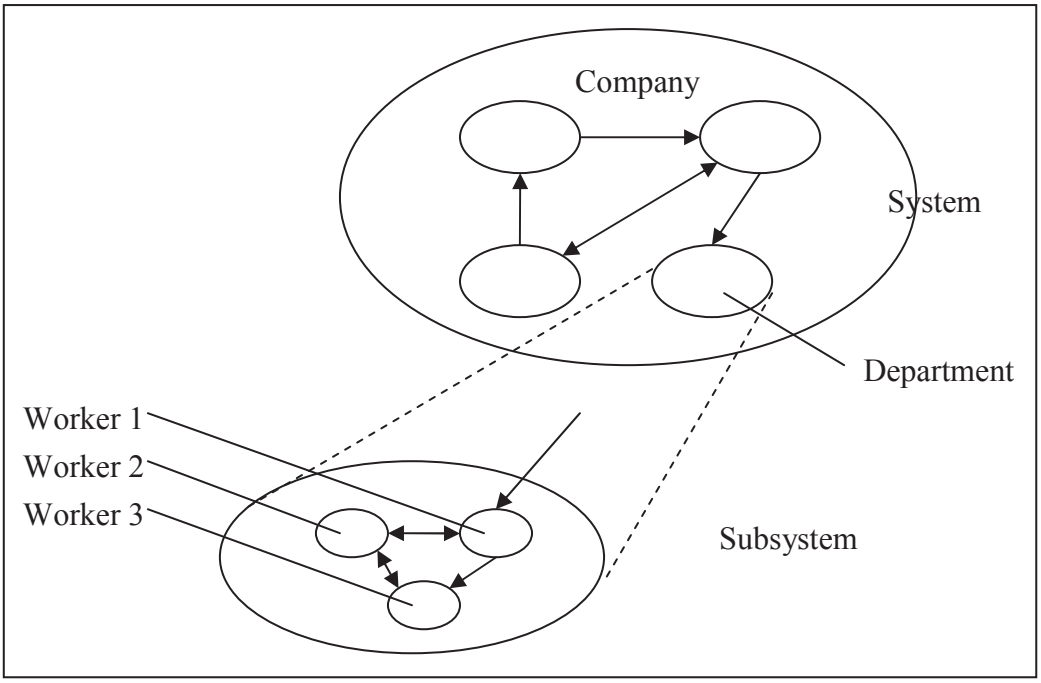

Fig. 3: System with Subsystem (Source: see Haberfellner p. 7)

"A management system is normally defined as the completeness of all organizational measures which are useful to reach defined company targets. Organizational measures contain the static structure and the dynamic rules of a company."[10]

[9] See: Haberfellner (2002), p. 6 et seq.
[10] Cit.: Pischon (1999), p. 96

As can be seen in Fig. 4, the management concept is defined as the mental basis for management systems. It virtually describes roughly the basis for a planned management system. The management model, which is the next step in installing a management system, is a more concrete description of the structures, functions and definitions that are important for the final system. It is normally used as a guideline of how to transform a selected concept into a real system. In contrary to the mathematical definition of models, this kind of model is not used to simulate the behavior of a real system, because it contains no information about how the system will react to changing inputs or surrounding influences. Finally the management system contains all the realized functions, documents and rules, which exist in the company.[11]

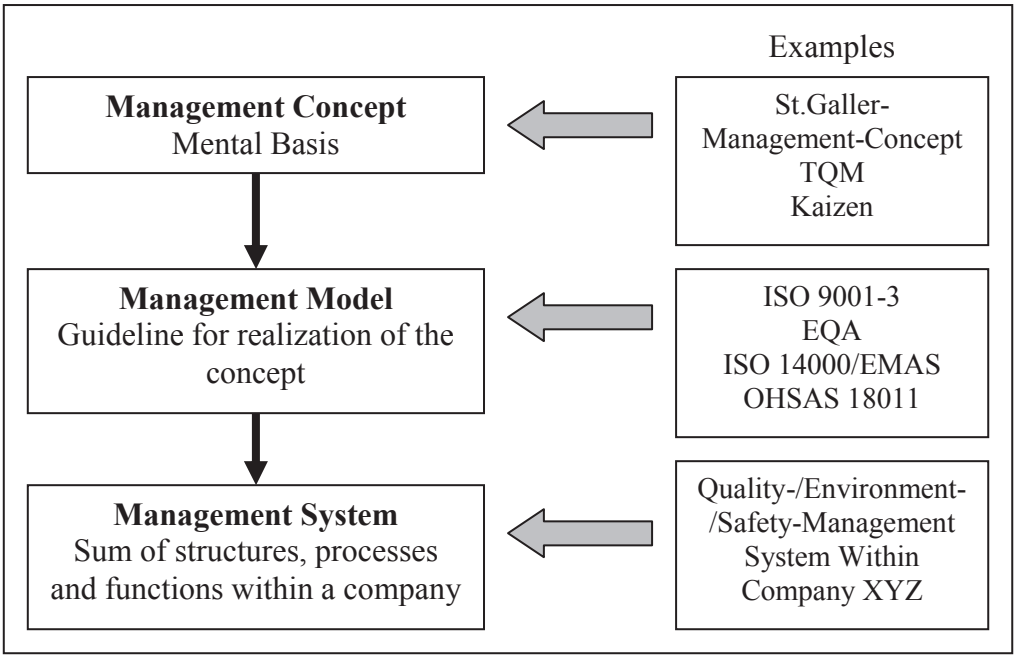

Fig. 4: Management-Concept, -Model and –System (Source: see Pischon, p. 98)

The main task of a management system is to increase the ability of a company to fulfill its targets. This is done by reducing the amount and impact of unpleasant happenings and by systematically structuring the organizational structures within the company. Additionally the management system seeks to increase the nominal, long time working power of the company. Since the empowerment of structures and functions needed for reaching the company targets are the main tasks of managers and company owners, a management system protects the company and leading people from damage and legal liabilities.[12]

[11] See: Pischon (1999), p. 96 et seq.
[12] See: Holzbaur (2000), p.153

2.3 Management Process

The management process or management cycle gives an idealized structure how the main processes of management are connected to each other. Since the feedback and feed forward connection (long arrows on the right and left of Fig. 5) link the different parts of the decision process, the act of making decisions will normally not be seen as a one-time act, but as a process containing different phases. Because of the multiple feed forward and feed back connections, this is not a linear process, but a complex, repeating process.

The structure shown in Fig. 5 gives an idealized picture of the management process. It shows that e.g. the target definition is required to define problems, but on the other hand the planning process might have an impact on the concretization of the targets. Additionally, some of the steps in this structure might be skipped for routine actions or if time is important for the prognosis of possible disruptions.[13]

Looking at the schematic structure, the four main phases of the management process can be structured as follows:

- Planning (containing the first five steps)
- Decision
- Realization
- Monitoring

[13] See: Schierenbeck (1995), p. 84

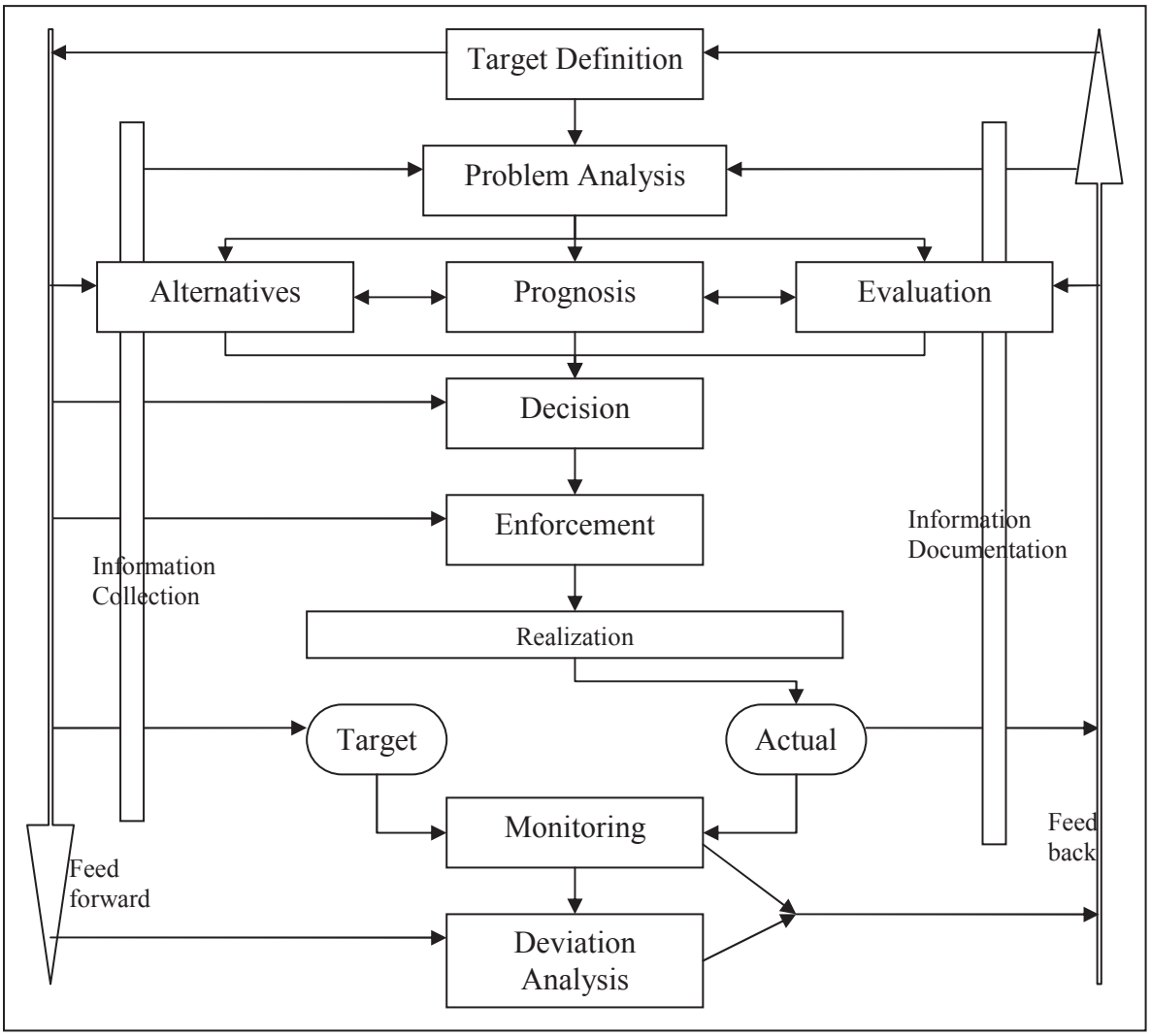

Fig. 5: Phase structure of the Management Process (Source: see Schierenbeck, p. 83)

2.3.1 Planning

The definition of planning differs very much between different authors. It reaches from the broadest meaningful definition, which contains all the phases from target definition until decision, to the narrowest definition, which only contains the three steps of finding alternatives, prognosis of reactions and rating of the alternatives.[14]

[14] See: Schierenbeck (1995), p. 85

In this definition the planning phase contains five different process steps. The target definition as the first has to search for possible targets, and is by itself a rather complex task for leading people, since the targets have to fulfill several principles. They need to be realistic, consistent, complete, transparent and measurable. The problem analysis deals with the definition and structuring of problems. This step is very important, if the problems are not yet known exactly. The analysis should contain some steps to be useful in the early and complete definition of problems. These steps are:

- Diagnosis of the actual situation
- Prognosis of the factors influencing the actual situation
- Comparison of the prognosis with targets for problem finding
- Dividing the problems into their parts
- Structuring of the problem elements according to priorities

After the problem analysis follows the search for alternatives. This step is used to generate many different methods which might be useful to solve the known problems. These alternatives have to be concrete enough that it is possible to see possible overlaps between them. They also have to fulfill some borders which are given by the organization itself.[15]

The prognosis immediately follows the alternative search. This process shows how the different alternatives for problem solving will interact with the operations of the company in the near future. This is very problematic, since the possibilities for such prognosis are rather limited by time and money, but the quality and reliability of such prognosis has a large impact on the decision process. During the last step of the planning process, the different alternatives will be rated. This is done by dividing the targets into smaller criteria, which are rated according to their relative importance. After this the different alternatives will be evaluated according to their ability to fulfill the different target criteria.[16]

Planning is a complex process of thinking and gathering information which has no defined beginning or end. It is always a risky process, since the evaluation of alternatives relies on prognosis which cannot be certain, and even with largest possible amount of work it is not possible to find all alternatives which exist for a given problem. Structuring and methodically approaching the planning process are used to minimize the risk coming of the incomplete information knowledge.

[15] See: Schierenbeck (1995), p. 84 et seq.
[16] See: Schierenbeck (1995), p. 87

2.3.2 Decision

After the planning has been finished with the evaluation of the different alternatives, it is time to decide which of the alternatives should be used. This in fact does not exclude the possibility and necessity of making some decisions during the planning process. In the ideal situation, the planning process should already have structured the alternatives according to a reliable rating system and also combined them to packages of measures, which will cover the whole amount of problems given, so that the decision process can be reduced to the sole acceptance of the best measure given. This is also the reason why the decision is not accepted as a main task of the management even if it is a vital part of the process. In literature the definition of decision is often different, containing some of the planning processes to enable the division of different decision types. (E.g. routine and innovative decisions, complex and simple decisions …)[17]

2.3.3 Realization

If the realization is done by different people/departments than the planning, the enforcement will become a unique process. If external parties are influenced by the decision, than it is important to convince them of its necessity, so that the main task of this process is the minimization of possible problems for the realization of measures. One of the most useful tools to prevent such problems is the integration of such parties and people concerned in the planning and decision process, so that they have the possibility to influence the measures from the very beginning. For the realization of the measures the creation of new working post, information and motivation of the employees are possible tools of enforcement.[18]

2.3.4 Monitoring

The monitoring immediately follows the enforcement and bringing into action of management decisions. It is used as connection and input for the subsequent planning process. The monitoring process not only contains the target/actual comparison, but also a deviation analysis, to find the reasons for deviations which have been found in the comparison. Both of these functions need to be closely aligned to previous management processes, to work correctly.

[17] See: Schierenbeck (1995), p. 87 et seq.
[18] See: Schierenbeck (1995), p. 88 et seq.

Another point is that the monitoring process is closely linked to the planning process, which leads to the definition, that monitoring is one of the main functions of management. Wild stated in 1982: *"Planning without monitoring is senseless, monitoring without planning is impossible."*

There are three primary types of monitoring:

- Assumption-monitoring: This has the goal of finding out if the facts, defined in the planning process as important for the decision are still valid in the actual situation.
- Result-monitoring: this monitoring (only) looks at the defined targets and compares them with the actual results to find out if there are any deviations. This can also include the monitoring of milestones in the planning process.
- Behavior-monitoring: this is process-oriented, and compares the techniques and processes used in the planning process and other management processes with the behavior and performance originally expected.[19]

2.4 Controlling Circle

Each system in a complex world is influenced by its surroundings. To simplify the understanding of this situation, the system itself is normally seen as a black box, with known inputs and outputs, but the actual activities inside are not looked at, even if they are known. Fig. 6 shows the simplest form of a controlled system. As can be seen, the output of the system depends on three different factors. The input contains the resources and knowledge needed to create the desired output. The stirring values are pieces of information, which the controlling person of the system uses to influence the system. And the third influences are the external factors, which are normally called disruptions, because they cannot be controlled and mostly have a negative influence on the output of the system.[20]

[19] See: Schierenbeck (1995), p. 89
[20] See: Holzbaur (2001), p. 40

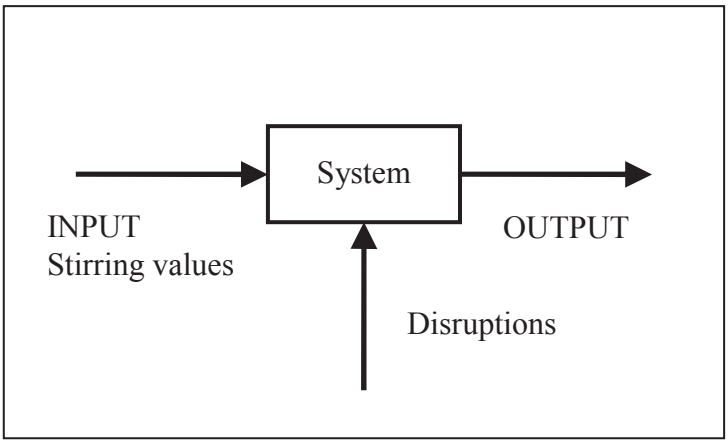

Fig. 6: Black-Box-Model (Source: see Holzbaur, p. 40)

To actually regulate a system, the operating system has to be connected to a ruling system via a control loop. As can be seen in Fig. 7, such a control loop enables the regulating system to change its stirring values according to the measured situation in the operating system. If the regulating system itself is working with changing target values, this control loop can be extended to a regulating circuit of higher order.[21]

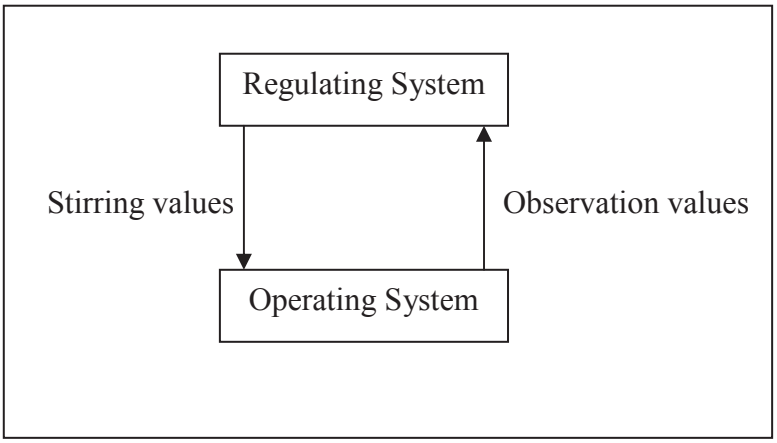

Fig. 7: Regulatory Circuit (Source: see Holzbaur, p. 42)

[21] See: Holzbaur (2001), p. 42

The regulatory circuit is a basic concept in the scientific approach of cybernetics (for more information on cybernetics see: Schwaninger, chap. 1), and gives a simplified view of guidance activities. In its simple form (as shown in Fig. 8, left side), the controlling circuit is measuring the output of a process and uses this data as input for the target/actual comparison. This reduces the controlling possibilities to a feedback regulation, because all the actual data received from the system is historical. In modern controlling circuits, most of the time the feed forward regulation is preferred. This regulation tries to anticipate the influence of disruptions before they occur, and uses this anticipated information for the regulation of the system.[22]

Even if this regulatory circuit may work with all physical, technical and social systems, it is not able to appreciate all the differences of those systems. The higher human-social systems have some unique abilities that have to be considered when creating an according regulatory circuit.

- Human-social systems have a consciousness
- They are able to regulate themselves
- They are composed of subsystems which have different targets and motivations

Because of these differences, the self regulation is of much higher importance for social systems than foreign regulation. Therefore the cybernetics of second order were invented to work with this self regulation in social systems, while the first order cybernetics concentrates on technical-physical systems in which the controller stands outside of the system.[23]

[22] See: Schwaninger (1989), p. 22 et seq.
[23] See: Schwaninger (1989), p. 23 et seqq.

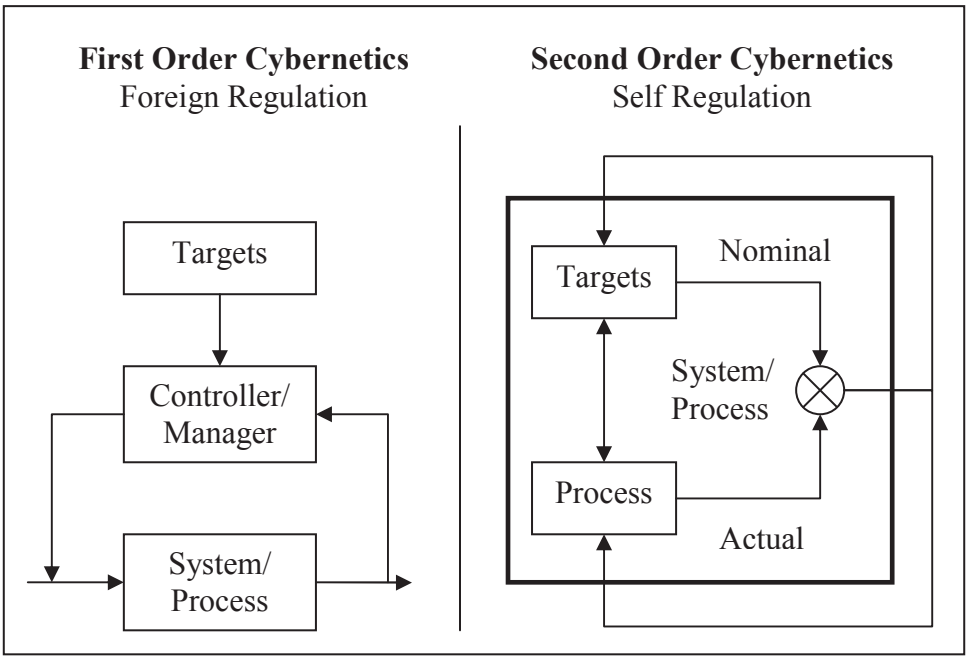

Fig. 8: Cybernetics of First and Second Order (Source: see Schwaninger, p. 24)

When using the controlling circle to manage a production system or company, the PDCA-circle is a very popular tool, which was first introduced by Dr. W.E. Deming[24] [25] for the use in quality control. The Deming circle defines a four-step process, which is often used for the continuous improvement of processes.

Deming introduced this method, which he referred to as the Shewhart circle, in the 1950s in Japan, where it helped to improve the Japanese industry to today's' standards. This method relies on reiteration for maximum effect, so that the user is intended to go through the circle over and over again, always implementing the knowledge he gathered during the last run.[26]

As can be seen in Fig. 9, the PDCA cycle consists of four different steps, which will be described below.

[24] For more information see: Deming (1986)
[25] For more information see: Kirstein (1994)
[26] See: Glaap (1993), p.12 et. seq.

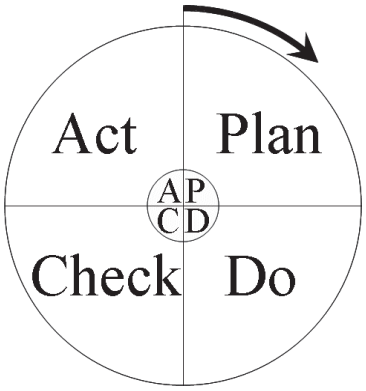

Fig. 9: Deming-Circle (Source: compare Masaaki, p.87)

- **PLAN:** in this phase, first the problem area has to be defined, and the performance factors have to be evaluated. After comparing the actual situation with the nominal, a measurable target for the improvement has to be defined. To find out the reasons for the problem, brainstorming in a mixed group is very helpful. When a list of possible sources is found, they have to be tested with the data known to find out how they influence the system. When the main drivers of the problem are known, a list of countermeasures has to be established, and then rated.
- **DO:** After the decision on the best countermeasures for the known problem, these countermeasures must be implemented. Therefore a timetable and a work plan must be designed. The desired plan has to be communicated to the affected employees, and a tracking system for the progress of the work has to be installed.
- **CHECK:** The checking of countermeasures should be measured and monitored already during the implementation phase. If additional information is necessary it has to be collected. According to the findings of this monitoring process, the implementation sequence might be modified. Mainly in this phase of the process the changes in the actual process which come from the countermeasures will be monitored.
- **ACT:** In the last step of the loop, the results of the implementation process will be evaluated to find out if the improved process works as planned. If the countermeasures have been effective, the improvements must be secured through standardization. The results should be shared with other departments or sections, who suffer similar problems, to prevent double work. After securing the improvement, the section under work should stay under continuous observation, to find possible other problems, and to improve the implemented countermeasures.[27]

[27] See: Hoseus („PDCA“), 28.12.2007

Some management systems also use the similar DMAIC cycle, which has only small differences in the work done in each phase. Unlike the PDCA cycle, the DMAIC cycle helps the user with several standardized tools for each of the steps. Additionally the DMAIC cycle, which is a main part of the Six Sigma methodology, doesn't start at a known problem in the processes, but at the needs of the customer.[28]

The five steps of the DMAIC cycle are:

- **Define:** In this step, the customers of a process and the special needs the process has to fulfill are defined. The important performance factors will be located according to this definition.
- **Measure:** In this phase, methods for the measurement of important performance factors have to be installed.
- **Analyze:** In this phase, the main task is to find the source of the discrepancy between the actual and nominal performance of the process. These sources have to be verified and it must be possible to quantify the power of their discrepancy, so that it can be estimated how much influence the correction of a specific problem source will have on the whole process. It is most important to verify the reasons for the problem, to prevent the work with simple but wrong problem definitions.
- **Improve:** In this step, solutions for the problems found in the last step need to be developed. Since there are many different solutions for each problem, it is important to find a rating system for them. The solution or group of solutions implemented in the process should ideally solve the problem without being too expensive.
- **Control:** The last step is to implement the improvements permanently into the process, and give the responsibility back to the process owner. The monitoring systems developed during the improvement work are also given to the process owner, and countermeasures for probable deviations have to be developed, so that they are ready for use when they are needed.[29]

2.5 Auditing

Regardless of the methods used to control a process or management system, the need for information is always the same. Auditing is a method used for gathering information and comparing the actual performance factors of a process with the nominal ones.

[28] See: Bannasch ("DMAIC-Methode", German), 22.2.2008
[29] See: Bannasch ("DMAIC-Methode", German), 4.1.2008

An audit is a survey method, which is broadly used in the industry nowadays. It originally derives from the Latin word for hearing. The audit is used to gather information about a project, organization, process, management system or product. This information is then used to validate if the object under survey is reliable and working within the given limits. It is mostly used as part of the quality management system, to ensure the quality of processes and products within a company.[30]

The international standard ISO19011 gives guidelines and recommendations for auditing. The norm consists of several chapters that cover all the topics related to auditing. As in every norm, the first three chapters contain some general information, like the scope and a glossary. Chapter four of the norm deals with the principles of auditing which are essential for the credibility of audits. The following three chapters deal with the most important facts about auditing, the management of audit programs, a guideline for auditing and the qualification of auditors. The standard can be used for both, quality and environmental audits.[31]

The ISO19011 standard is closely linked to the ISO9000 quality standards and the ISO14001 environmental standard, so that it can be used together with both of them. For a detailed description of this standard see chapter 6.2.

Since the workload of an audit is very large, and the time and money available for it are limited due to economic considerations, audits normally only seek a reasonable assurance that the objects under study are relevant. This also includes the use of statistical methods and random sampling. Even if audits were originally used mainly for gaining financial information, they are now used in almost every aspect of the industry. (quality, security, knowledge, information management …)[32]

Since auditing is a rather complex activity which needs a lot of preparation, it is done by specialists who have been educated for this job. Depending on the stakeholders of an audit, the auditors can be employees of the company under inspection, employees of the company commissioning the audit or external experts. When structuring audits according to the relationship between the auditor and the auditee, there are three different kinds of audits, which also aim for different stakeholders.

[30] See: Gebhardt („Audit“, German), 4.1.2008
[31] See: ISO19001:2002, Introduction
[32] See: ISO19011:2002, Introduction

- **1st Party audit:** This is also called internal audit or self audit. This audit is done by the employees of the organization. This kind of audit is mostly done to provide information for the own management, and for regulation aspects. To provide impartiality as demanded by every norm related to this theme, the auditor may not be responsible for the work being audited.
- **2nd Party audit:** The second party audit is one of the two external audits. It is normally conducted by parties having a reasonable interest in the work of a company, like customers or shareholders. These audits might sometimes be done by a central auditing department of the company in which the audit is done, or by an external auditing company.
- **3rd Party audit:** The third party audit is the most complex one, since it is done by external auditing companies. This audit is normally done, to assure, that the company has the right to hold a certificate. This kind of audit normally provides the most objective view on the processes or departments being investigated, since the auditors normally are completely independent of the company being audited.[33]

Regardless of the party which commissions the audit, all audits are structured similarly (see Fig. 10). If a company wants to do several audits over a longer time period, an audit plan has to be established. This audit plan contains the timetable and elements of the company which are to be evaluated regularly. This plan should be established in such a way, that it has a forecast of approximately one year.[34]

For audits which are not part of the audit plan, the process starts with a detailed preparation sequence. For planned audits, parts of this preparation will already be included in the audit plan. After the preparation, the on-location auditing activities are scheduled, and afterwards the results are presented, and follow-up procedures are defined.

[33] See: ISO19011:2002, chap. 3.1
[34] See: Rüdenauer („Audit-Ablauf"), 4.1.2008

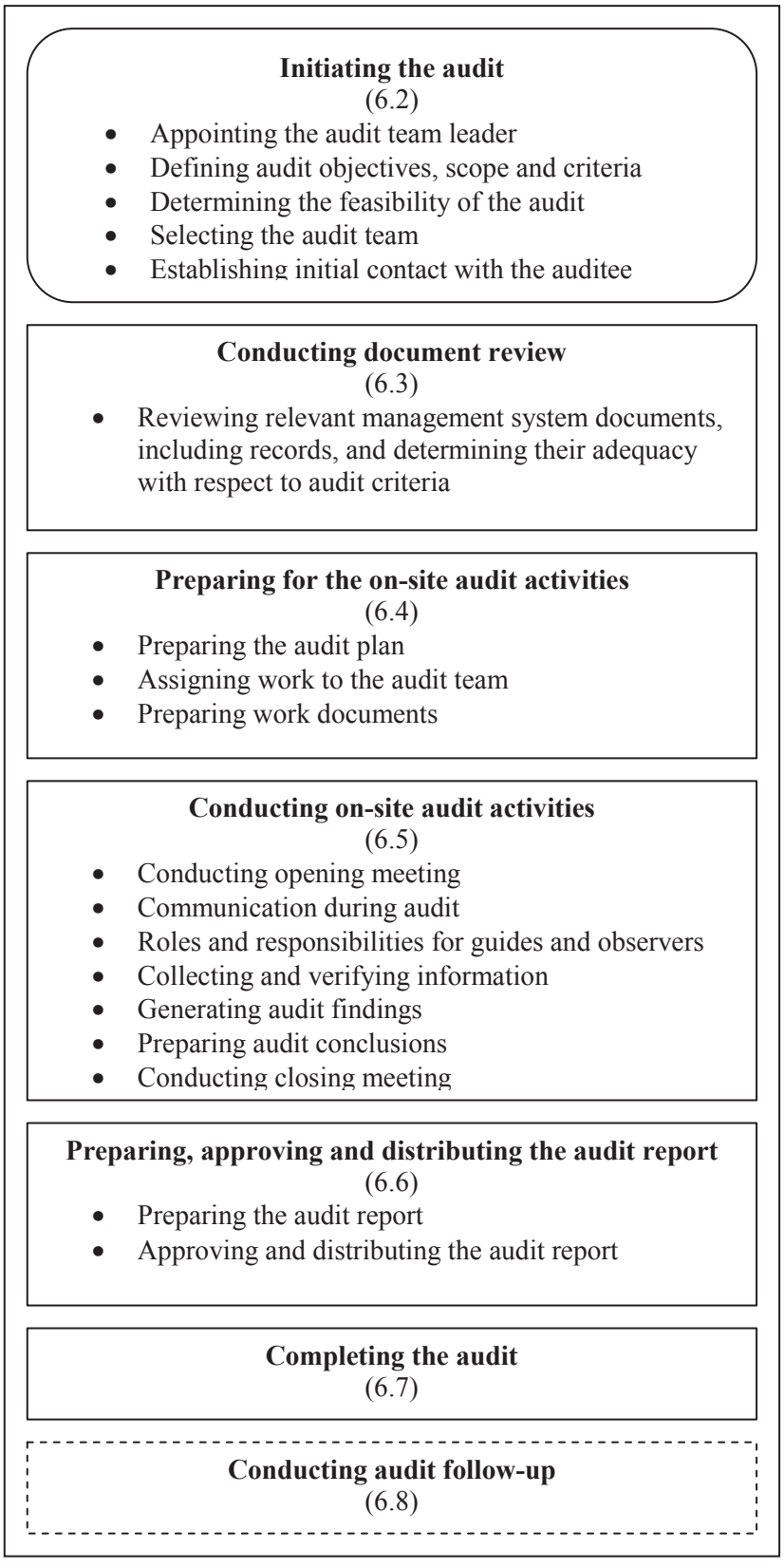

Fig. 10: Overview of Typical Audit Activities (Source: see ISO19011:2002 chap. 6.1)

2.5.1 Audit Initialization

The audit preparation consists of several steps. First the process/department of the audit has to be defined and divided into smaller parts, so that the audit is able to find problems at the interfaces. The next step is to define the targets of the audit, since a single audit is normally unable to control every aspect of a specific process.[35]

After defining the audit targets, the audit team has to be set up. Here the challenge is to appoint auditors which have the qualification needed for that specific audit-auditee constellation. For smaller audits, a single auditor might be adequate, but for larger audits normally a group of auditors is selected, to provide all the expertise needed for every aspect of the audit. If the auditors don't have enough experience with the work of the auditee, an expert from the auditee can be appointed to fill the gap.[36]

After gathering information about the processes and target values of the process under inspection, the auditor can set up a plan for the information needed to complete the audit. This list will normally be part of the things talked about during the initial contact with the auditee, where the communication channels are established and the audit is fixed.[37]

2.5.2 Preparing On-Site Activities

In preparation for the on- site activities of the audit, the auditor has to set up a timetable for the inspections and interviews needed for the audit. This timetable is set up together with the auditee, since most of the activities will probably interfere with the normal work of the auditee. Such a timetable is also very important to reduce the overall time needed for the audit, if there are several interviewing partners needed, or the auditor has to travel longer distances. It can also help reduce the impact of auditing on the normal work of the auditee.[38]

The audit plan (here only related to one specific audit) has to include the audit targets and criteria the time table for the audit activities, the audit scope and the places and people involved in the audit activities. If the auditee is not used to being audited, a pre-meeting can be very useful, to explain the background of the audit, and to reduce the defensiveness of the employees who might fear for the security of their jobs.[39]

[35] See: Rüdenauer („Audit-Ablauf"), chap. 1,2, 4.1.2008
[36] See: Rüdenauer („Audit-Ablauf"), chap. 3, 4.1.2008
[37] See: ISO19011:2002, chap. 6.2.4, 6.2.5
[38] See: Rüdenauer („Audit-Ablauf"), chap. 5, 4.1.2008
[39] See: Rüdenauer („Audit-Ablauf"), chap. 6, 4.1.2008

2.5.3 Conducting Audit

The on-site activities of the audit normally start with an opening meeting to get all involved people on the same knowledge level, according the audit. In the opening meeting, the timetable for the interviews, the responsibilities and other organizational things related to the audit are presented. It is also recommended to introduce the auditors to the employees, and to summarize the scope and objectives of the audit. During this meeting, the employees of the auditee also have the possibility to ask questions about the audit, to clear up any uncertainties.

During the audit, the team should meet periodically to exchange information about the progress of the audit and any serious concerns which might make immediate actions necessary (e.g. severe security problems). The audit team leader is responsible for the communication with the audit client and the auditee. He will inform them about the progress of the audit and also about any findings which will not be investigated closely during the audit. If the audit team finds any serious problems, the audit team leader is responsible for the immediate information of the auditee and the audit client, so that corrective actions can be taken.[40]

After the collection of information and generation of audit findings, the on-site activities of the audit end with a close-out meeting. In this meeting, the auditors present the audit findings to the audit client and the auditee. For operations deviating from the audit criteria, the auditor should mention the necessary corrective measures, and may also give tips on what they might look like. If these measures are not too complex, the timetable and responsibilities should be fixed during this meeting. To prevent misunderstandings, also the auditee has the possibility to respond to the findings of the audit.[41]

2.5.4 Audit Report

After finishing the audit activities, and the close out meeting, the audit team leader has to generate the audit report which includes all the audit findings, reference documents and people involved. Additionally the audit report contains the audit findings and the recommended and agreed corrective measures, including the timetable and responsibilities. The audit report is then distributed to the auditee and the audit client.[42]

[40] See: ISO19011:2002, chap. 6.5.2
[41] See: ISO19011:2002, chap. 6.5.5 et. seqq.
[42] See: ISO19011:2002, chap. 6.6.1

Normally the audit ends with the distribution of the audit report, so that the follow-up procedures are not part of the audit any more, and the auditor is not responsible for the corrective measures. These measures can be controlled later by random sampling of products, or with another audit at a later time, which is common if the audit findings pointed out several severe problems.[43]

[43] See: ISO19011:2002, chap. 6.7 et. seq.

3 International Standards for Management System Audits

There exist several international standards, which comply to management systems, in this chapter, the most important for quality management, environmental management and worksite health and security management are described shortly.

3.1 Quality Management

The term ISO9000 family normally includes 3 different norms which are active at the moment. This series of ISO-norms explains the minimum definitions a modern quality management system has to fulfill, to get a certification. The norm itself is only a recommendation, which offers tips and hints how to organize the quality management system, but it is up to each company to decide if they want to use the methods mentioned in the norm or not.

As each product has its own quality demands, it has to be produced under unique quality assurance methods. Quality management systems on the other hand are independent of the product created by a company, so that even the management systems from companies as different as a barber and a steel mill can be set up in a similar way.

To organize and control a company effectively, the organization must be structured in a clear, systematic way. One possibility to do this is the creation of a management system according to the guidelines given in the ISO9000 family of norms. These guidelines help to create a management system, which derives quality from the need of “customers”, and emphasizes a continuous improvement of the processes involved.

The quality management norm ISO9000 focuses on 8 principles for quality management:

- **Customer focus:** Quality is defined by the needs and wishes of the customer, because he is the one who buys the product. The company is dependant on the customers, and therefore it is essential to know the needs of customers, and at least fulfill them. The company should permanently try to exceed the quality expected by the customer.

- **Leadership:** The management is responsible for the environment needed in the organization, which enables all employees to fulfill the objective of the organization. It is the responsibility of the management to unite the purpose and direction of the organization.
- **Involvement of people:** Employees are the heart and soul of a company, regardless of the hierarchical level they are working in. Only if they are fully involved can their abilities be used for the benefit of the organization.
- **Process approach:** A desired result can be achieved more effectively, if the resources and activities are managed as a process. This means, that looking at the whole process of creating a product will help to allocate the input more effectively, than only looking at distinct parts of the product creation.
- **System approach to management:** The management of an organization is defined by the processes involved and their relationship. Therefore the management has to find a way to understand the connections between the elements and processes, to effectively manage an organization. A systematic view of the organization, including most, if not all, elements and connections helps in understanding, how changes in one part of the organization will interfere with other parts.
- **Continual improvement:** One of the most important objectives for the organization should be the continuous improvement of all the effectiveness and efficiency of processes and the interfaces between them. This should be a permanent goal of every employee, regardless of the position he holds in the organization.
- **Factual approach to decision making:** Effective decisions depend on the knowledge of problems and on the analysis of given information and data. Therefore a structured approach to decisions can drastically increase the ability to solve a problem.
- **Mutually beneficial supplier relationship:** The qualities of products created by a company are, to a large extend, dependant on the quality of the raw materials used for the production. Therefore every company and its suppliers are interdependent. Introducing a mutually beneficial relationship improves the ability of both companies to create valuable products.[44]

[44] See: ISO9000:2005, chap. 0.2

The three norms that can be seen as core of the ISO9000 family are the ISO9000, ISO9001 and ISO9004. Additionally the auditing norm ISO19011 can be seen as complementary to the ISO9000 family. The ISO9000 is the base norm for quality management, it does not give instructions how to create or organize a management system, but instead it is some kind of dictionary to explain terms and vocabulary used in the other norms. It also shows how the Deming circle influences the structure of the quality management norm.[45]

The chapters 4 to 8 of the norm describe the different responsibilities and procedures of a process based quality management system (see Fig. 11). As can be seen in the figure, the customer is the main driver for improvements as his requirements are one of the main inputs for the process circle. Additionally the PDCA circle can be applied for every process.[46]

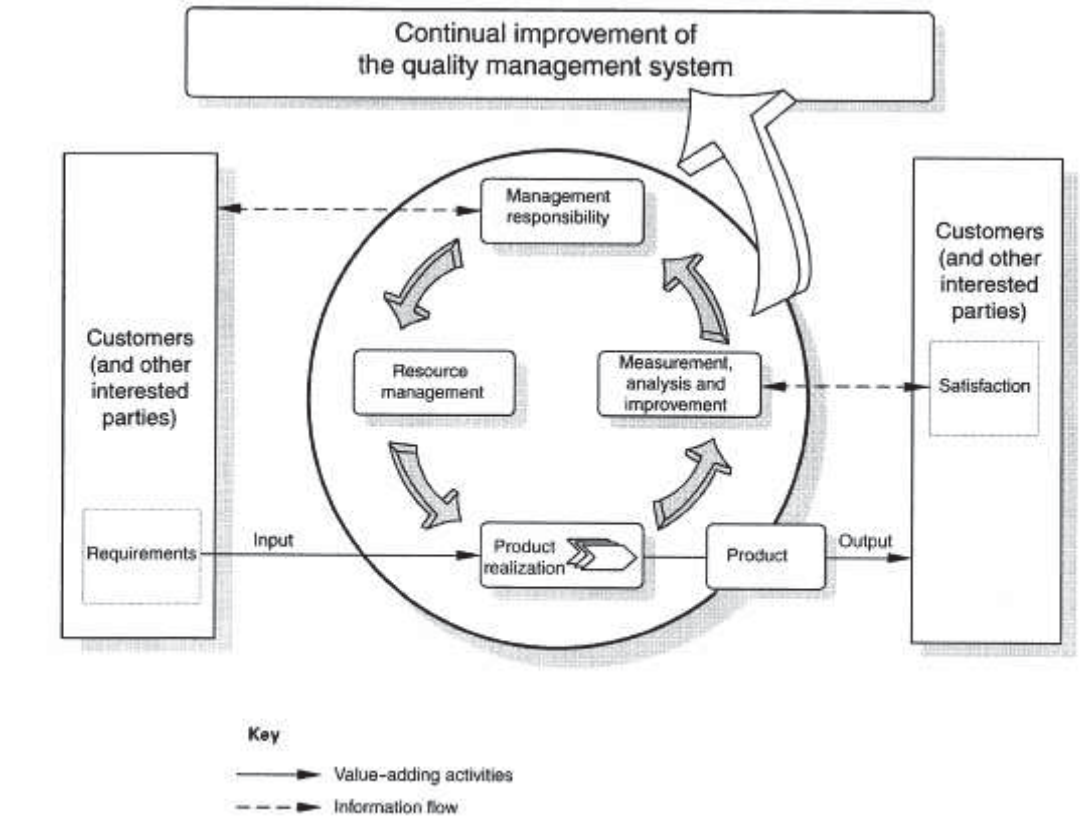

Fig. 11: Quality Management System Model (Source: ISO9000:2005, chap. 2.4)

[45] See: Gebhardt (ISO9000 – ISO9004), 8.2.2008
[46] See: ISO9001:2000, chap. 0.2

The ISO9001 gives the user a complete list of specifications for a management system, which enable the user to test its ability to create products at the quality demanded by customers and authorities. This norm completely describes the model of a management system useful for quality control. This norm also gives the standard needed for certification of the quality management system.[47]

The last member of this norm series is the ISO9004, which mainly gives the user a guideline to improve the effectiveness and efficiency of his quality management system. The norm contains guidelines how to orient the organization to head for total quality management (TQM). This norm on the other hand gives no properties for contracts of certifications as the ISO9001 does.

3.1.1 Structure of Norm

The ISO9001 is divided into eight chapters, of which the first three contain the introduction and a glossary. The fourth chapter contains general information about the requirements of management systems. It explains what documents are needed to test the efficiency of the management system, and what information needs to be documented.[48]

According to the parts of the Deming circle (see Fig. 11) the chapters' five to eight explain the responsibilities of the involved departments. Chapter five points out the responsibilities of the management. These consist of the commitment of the management ("Quality is a boss's job"), the quality politics, which have to be defined and communicated to the employees. It also contains the demand that quality is defined by the customer, because he is the one paying for the product. Other responsibilities for the management are the planning of quality targets and politics, the communication of quality targets and other vital information within the company and between departments and the assessment of the quality system, to make sure that it is always able to fulfill its goals in a changing environment.[49]

To increase the willingness of employees to work for better quality, the management has the possibility to share responsibility and authority with the workers, so that they can increase quality in their working field.

[47] See: ISO9001:2000
[48] See: ISO9001:2000, chap. 4
[49] See: ISO ("Leitung"), 20.12.2007

In chapter six, the management of resources is defined. First the availability of resources (material, information and qualified people) has to be secured to provide customers satisfaction. Within a positive environment and with the right infrastructure, employees will have better chances to produce better products or provide better services. The resources have to be managed in a way that each process has the correct resources at hand. Since every production or service needs people to control and secure its quality, these employees have to be qualified for that work. This can be achieved by training, competence and experience.[50]

The infrastructure and environment of a work place are also very important. Without the correct infrastructure a worker is incapable of producing anything. The shape of infrastructure has to be suitable for the needs of the customer and contain the infrastructure of support processes. If the environment of a working place has a positive impact on the mood of the workers, this will increase the motivation and potential of the employees to create better products. The minimum requirement for a good environment is given by the security rules.[51]

Since the product of a company is the main element of income, the product realization has to be planned accordingly. The process of product creation has to provide for fast production and prevent bottlenecks wherever possible. The organization has to make sure that the quality and special features demanded by a customer can be fulfilled before a contract is made. The correct development of new products has a big impact on the possibility of producing them. If the resource supply and product creation are not defined exactly during the development phase of new products, this might lead to severe problems during production.[52]

The supply of raw materials has to be planned so that the production process is not disturbed by missing resources, and that the suppliers can deliver their products on time. The lower the amount of resources in the company is the higher is the effort needed for the supply chain. A process which is not controlled cannot produce products of quality. To control a process, the needed resources and infrastructure have to be at hand before the process starts. To provide quality, the features of a product or process have to be measured regularly (sometimes even permanently). Measuring instruments are unable to provide correct results if they are damaged or dirty. According to the quality required, the measuring instruments have to be calibrated and controlled regularly, to prevent decreasing quality due to measuring errors.[53]

[50] See: Gebhardt („Ressourcen“), 20.12.2007
[51] See: Gebhardt („Ressourcen“), 20.12.2007
[52] See: Gebhardt („Produktrealisierung“), 21.12.2007
[53] See: Gebhardt („Produktrealisierung“), 21.12.2007

The last chapter of the norm explains how the inspection and supervision of products has to be managed. First the organization has to make sure that the quality measured in a process is still correct for the actual requirements of the market. Additionally the quality of products can only be increased if the relevant quality factors are measured. Since it is impossible to create 100% of the products without errors, the process needs possibilities to pick defective products out of the production. Errors are a chance to increase quality. To prevent defective and good products from being mixed during the production process or between process steps, a strict marking system has to be established.[54]

In order to make any meaningful decisions, information data and analysis are important. In the past many companies made the mistake of creating gigantic databases with facts that nobody needs. Since the gathering and storing of information is time and money intensive, the people in charge of such information systems have to make sure that only such data is sampled, which is actually needed for the management of a process/organization. To be successful in a competitive environment, an organization has to make sure that its products are free of errors. To prevent products from being faulty, it is important to analyze the cause of faults. Only by such a structured approach to the error prevention, can a product or process be improved continually. Most of the time the small improvements are those which have the largest impact on the long run.[55]

3.2 Environmental Management

The environmental standard family consists mainly of two different papers. The ISO14001 cites the requirements for an environmental management system (EMS) while the ISO14004 gives some general EMS guidelines. Other guidelines which belong to this family additionally address specific environmental aspects, like life-cycle analysis of performance evaluation.[56]

As with most other international standards for management systems, the environmental standard focuses on continuous improvement actions as the main tool to reach the cited environmental goals. An EMS which meets the requirements cited in the ISO14001 is a tool which enables the company to identify and control the environmental impact of activities and products, and to improve its environmental performance continually.

[54] See: Gebhardt („Messung“), 21.12.2007
[55] See: Gebhardt („Messung“), 21.12.2007
[56] See: ISO (ISO14000 Essentials), 10.2.2008

Since a standard specifying exact levels of environmental performance would only work for one business sector, the ISO14001 gives general information on how to reorganize the policies and business plans in a strategically systematic way. This provides companies with the ability to control and improve their environmental performance.[57]

Since many companies already started with environmental audits long before the ISO14001 was created, it is clear that environmental issues are a major aspect in modern economics, but audits alone are probably insufficient to ensure a company that its environmental performance is satisfactory all over the time. Therefore it is important to implement a management system in the company which is supported by every level and every function within the company.[58]

With a working EMS, a company has the framework needed to create concrete environmental targets and to control the degree of compliance. It additionally offers the possibility to give reliable feedback about the environmental performance to external organizations.

3.2.1 Structure of Norm

The ISO14001 consists of several parts (see Fig. 12):

- Scope of the standard
- Glossary of the terms used in the standard
- General environmental requirements
- Specific requirements for PDCA cycle

[57] See: ISO (ISO14001 essentials), 10.2.2008
[58] See: ISO14001:1996 “Introduction”

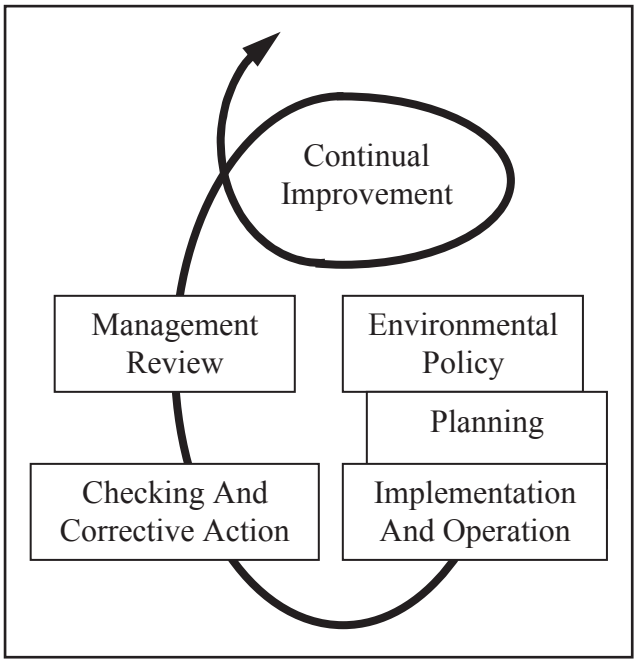

Fig. 12: Environmental Management System Model (Source: see ISO14001)

The scope of the ISO14001 is to provide companies with requirements suitable to create an EMS that is able to fulfill legal requirements and handle information about important environmental issues. The standard is suitable for all the environmental issues the company can observe and influence, but it states no specific environmental performance criteria.[59]

The general requirements of the standard, which also include the environmental policy, provide the company with information about the responsibilities of the top management, which are:

- That the EMS is appropriate to the nature and scale of environmental impacts of the company's activities and products.
- That the EMS commits the continual improvement of environmental performance and pollution reduction.
- That the EMS complies with legal environmental regulations and the requirements of other important organizations.
- That the EMS is documented and reviewed regularly and available to the public.[60]

[59] See: ISO14001:1996, chap. 1
[60] See: ISO14001:1996, chap. 4.1 et. seq.

In chapter 4.3 the specific aspects of the planning are cited. The environmental aspects include the demand to establish and maintain procedures to identify the environmental aspects and issues which the company can influence. From this list, the major impacts have to be selected and included in the overall environmental planning processes. Naturally these data have to be kept up to date at all times.

Any legal and other important requirements have to be included in the EMS, and the company has to make sure that it always knows which regulations apply to its activities. These legal requirements have to be taken into consideration when targets and environmental objectives are generated. Since the available technology is changing all the time, and most legal requirements are based on the actual technology, the company has to be informed about up to date technology applicable for the reduction of environmental impacts.[61]

The establishment of programs to guarantee the fulfillment of environmental targets is necessary for the long-term benefit of environmental management systems. These programs normally include the responsibilities, time tables and economics for each defined function and department.[62]

For the correct implementation and operation of EMS the roles and responsibilities have to be documented and communicated. It is the duty of the management to provide the resources required to form and operate the EMS. Additionally the top management assigns the employees for maintenance and supervision of the EMS. These employees have to be granted the needed authority to fulfill their task.[63]

To ensure the function and effectiveness of an EMS, the company has to make sure that all employees affected by the EMS get the needed training. Additionally procedures are needed to inform the employees of the importance of the environmental management system, and how their work influences the environment. Since many internal end external interest parties exist, the company has to document all its decisions and aspects relevant for the environment, to communicate them as needed.[64]

[61] See: ISO14001:1996, chap. 4.3.2 et. seq.
[62] See: ISO14001:1996, chap. 4.3.4
[63] See: ISO14001:1996, chap. 4.4.1
[64] See: ISO14001:1996, chap. 4.4.2 et. seq.

For the purpose of communication, all necessary elements of the management system and the related documents have to be listed, to ensure that they can be located at any time. Since many operations and activities influence environmental aspects significantly, these activities have to be planned and structured in a way which makes it possible to control the activities and therefore also control the environmental influences. Additionally the organization is responsible for the creation, maintenance and updating of emergency procedures and plans for all potential emergency situations.[65]

After implementation of an environmental management system, the procedures and activities have to be documented and regularly reviewed, to ensure the conformity with the EMS criteria. The documents resulting from these monitoring activities have to be stored as cited by the company, and the needed monitoring devices have to be calibrated regularly.[66]

To ensure the correct function of all operations under investigation, responsibilities and authorities for the investigation and correction of these operations have to be created. Since the environmental impact and economic severity of unconformities can be very diverse, the according preventive and corrective actions have to be appropriate.

One possibility to monitor the conformity of actions and operations is the environmental management system audit. The main task of an audit is to ensure the correct implementation of activities and their conformity with the EMS. Additionally the findings of audits are reported to the management. The audit and its timetable have to be appropriate for the environmental importance and the results of previous audits.[67]

Finally, the EMS itself has to be reviewed regularly by the management to ensure its ongoing effectiveness and suitability. This regularly review is important to ensure the continual improvement of the whole system, as is demanded in the standard.

3.3 Health and Safety Management

In contrary to the ISO standards, the OHSAS18001 is not declared to be a norm, but only a voluntarily usable summary of important facts and guides for occupational health and safety management. Since in modern times integrated management systems gain more importance, the OHSAS18001 standard is compatible to the ISO9000 and ISO14001 international norms.[68]

[65] See: ISO14001:1996, chap. 4.4.5 et. seqq.
[66] See: ISO14001:1996, chap. 4.5.3
[67] See: ISO14001:1996, chap. 4.5.4
[68] See: OHSAS18001:1999, Introduction

The specifications cited in the standard can be used to establish a management system for the control and reduction of occupational health and safety risks. It contains no specific criteria for occupational health but only specifications for the establishment of an according management system. Additionally the standard only relates to occupational health and safety but not to product security.[69]

3.3.1 Structure of Standard

The standard itself is structured in a similar way as the environmental norm ISO14001. The first three chapters deal with the scope and definitions of the standard, while chapter four (see Fig. 13) contains the elements of an occupational health management system (OMS).

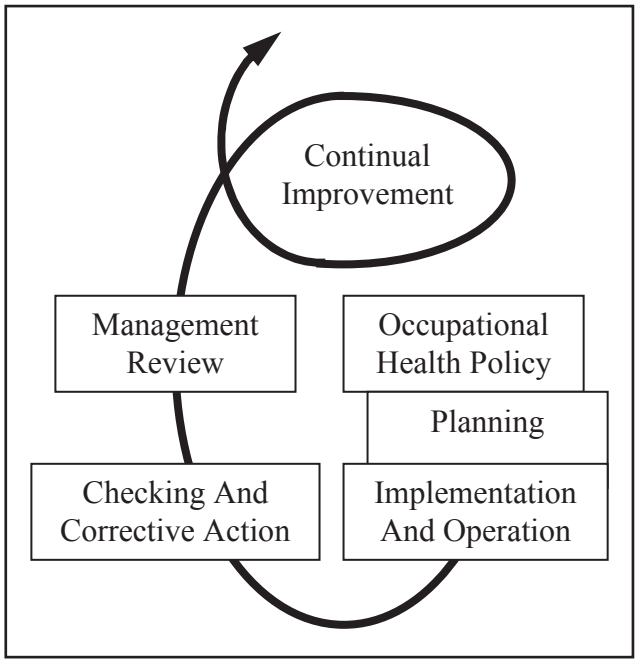

Fig. 13: Occupational Health and Safety Management System Model (Source: see OHSAS18001)

The health policy has to be approved and authorized by the management. It contains the overall targets for occupational health and security and has to be applicable for the amount and type of risks within the company. All legal requirements have to be fulfilled and the employees have to be informed about the content of the policy. To ensure the continual improvement of the OMS, all parts of it, including the policy have to be reviewed regularly.[70]

[69] See: OHSAS18001:1999, chap. 1
[70] See: OHSAS18001:1999, chap. 4.2

Chapter 4.3 describes the planning of risk management and demands continuous observation of possible risks regarding routine and non routine works of all people having access to the work site. Additionally the organization has to make sure, that results of evaluations are implemented and that all information gathered is documented. Any legal or other requirements concerning the occupational health and safety of a company must be known and implemented.[71]

An OMS can only work efficiently if the responsibilities and authorities of employee are defined and documented exactly. These employees have to manage and supervise the operation of security systems, but the final responsibility lies always at the top management. Every employee has to possess the skills necessary for his duties relevant for occupational health. Therefore the organization has to ensure the knowledge and training of these skills and the knowledge of relevant health and safety regulations. At last, the organization is responsible for the communication of relevant information to and from employees and interested parties.[72]

To ensure the efficiency of implemented security guidelines, the organization has to regularly investigate and measure the management system. The devices needed therefore have to be calibrated regularly. According to the requirements of the company, methods for investigating risks and accidents must be implemented. Every incident and happening has to be documented in such a way, that the information can be stored for later use. One way to ensure the efficiency of the whole system is the investigation via audits.[73]

The last chapter explains the responsibility of the management to regularly investigate the occupational health and safety regulations, to make sure, that these regulations are always up to date, and that they are continually improved.[74]

[71] See: OHSAS18001:1999, chap. 4.3
[72] See: OHSAS18001:1999, chap. 4.4
[73] See: OHSAS18001:1999, chap. 4.5
[74] See: OHSAS18001:1999, chap. 4.6

4 Data Acquisition by Survey

One of the tasks of this master's thesis was to find common practices for auditing in the petroleum industry. This information had to be collected by a survey since this is the most common method to collect information about a subject of interest.

4.1 Survey Phase Model

A survey is a structured method of gaining information. The idealized structure of a survey with its five main phases can be seen in Fig. 14. These phases are:

- **Definition phase**: in this phase the question at hand has to be converted into a research problem and possible targets have to be set.
- **Design phase**: in the second phase, the research project and the survey are planned exactly. This is based on a theoretical hypothesis.
- **Field phase**: the central part of this phase is the data acquisition, including the preparation and organization of the data acquisition activities.
- **Analysis phase**: in this phase the collected data has to be coded for the use of various analysis methods, which might include simple counting or even multivariate analysis. Only after such analysis the data can be interpreted.
- **Communication phase**: at the end of the survey, the information gained has to be presented to the appropriate people. This can be done by writing a research report or presenting the results at a meeting. It is most important to present the information in a way that the customer can use.[75]

[75] See: Herrmann/Homburg (2000), p. 18

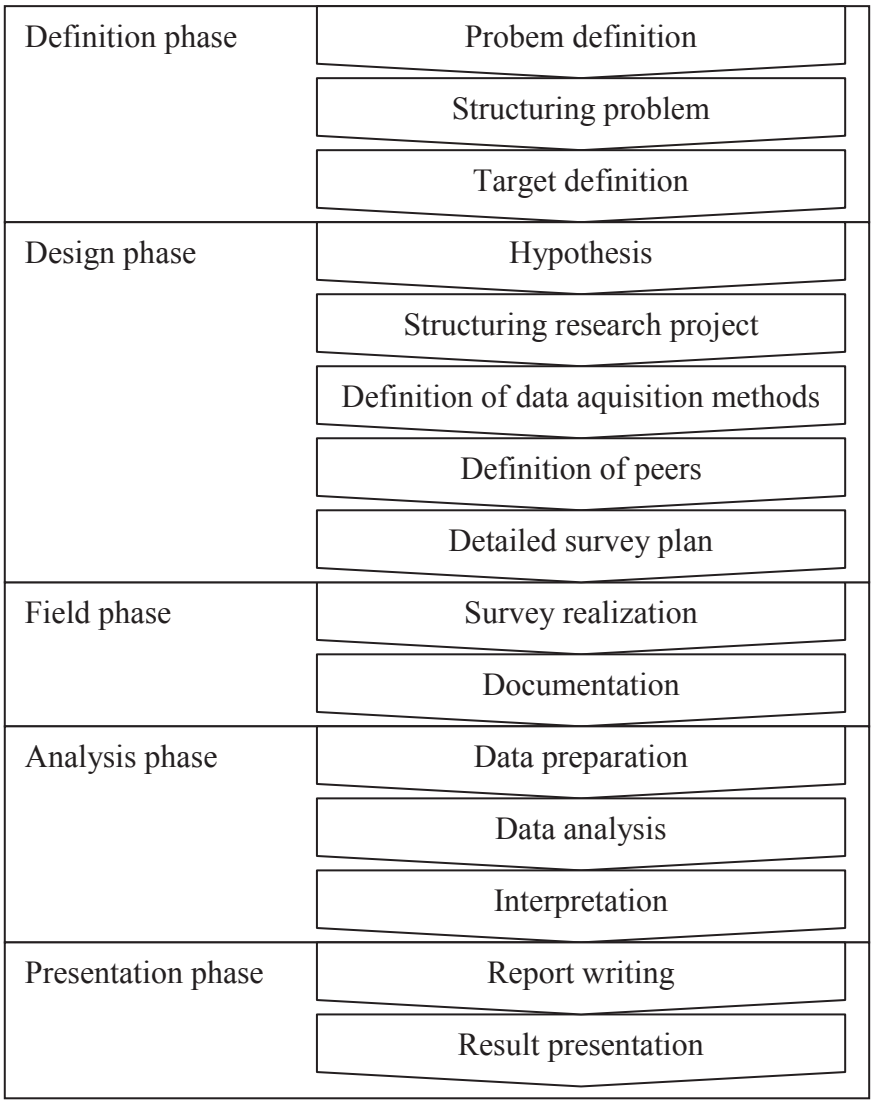

Fig. 14: Phase Model of a Survey (Source: see Herrmann/Homburg, p. 19)

4.2 Survey Methods

In this chapter some main surveying methods will be described with their individual strengths and weaknesses. At the end, the methods will be compared, to show, why the written questionnaire was selected for the work.

4.2.1 Oral Interviews

The interview was once the most important survey method and is widely used even nowadays, which is also reflected by the fact that it is sometimes actually called interview research.[76]

[76] See: Hüttner (1997), p. 67, p. 76

In an oral survey, the interviewer and the interviewee meet face to face. This can be done in different places, like at home or on the street. The direct contact of the participants provides some options to increase the performance of a survey. First of all, the interviewer has the possibility to react if the asked person doesn't understand a question correctly. Another important fact is that the interviewer has the possibility of using all kinds of documents or utilities to underline the questions, or help in the understanding of the interview.[77]

Different kinds of interviews can be distinguished according to where they take place. The "in home" interview is characterized by the fact that the respondent is asked in a known place, which normally increases the comfort, and therefore gives the ability to conduct long interviews. Such "in home" interviews may have a length of up to one hour, but on the other hand, this kind of interview requires a lot of time and resources, since the interviewer has to contact each participant personally at home. Additionally, the participant defines the time of the interview.[78]

The "in hall" interviews on the other hand use some interviewing rooms near the place where the participants are recruited, which reduces the amount of travel time for the interviewers and allows for identical interviewing situations for every participant. This centralized situation also gives the possibility of using larger and more utilities and documents which would otherwise be too heavy or expensive. Unfortunately the unknown surrounding reduces the time available for interviews, since the participants normally don't feel as comfortable as at home, or need to go back to the duties from which they have been pulled.[79]

Additionally there are the possibilities for short interviews on the street or in shops. These kinds of interviews are rather restricted in the time available and also because they are normally not representative due to the restricted working radius. Therefore this kind of interview can only be used for surveys which can work with such restricted peer groups. On the other hand, the short interviews are much cheaper than the larger in home or in hall interviews.[80]

The largest downside of the personal interview is surely the cost of such a survey, since lots of interviewers have to spend a lot of time on it. Because the interviewer or the participant has to go to a defined place for the interview, the operating radius is restricted by travel time. The representative aspect of the survey can be hard to achieve, and the interviewer has a big chance of influencing the answering scheme of the participants.[81]

[77] See: Kamenz (1997), p. 85
[78] See: Wyss (1991), p. 323 et seq.
[79] See: Wyss (1991), p. 328 et seq.
[80] See: Wyss (1991), p. 333 et seq.
[81] See: Hüttner (1997), p. 76 et seq.

4.2.2 Telephone Interviews

The interview by phone is comparable to the personal interview over a large area, but there are also some significant differences.

In the telephone survey, the interviewer has the possibility to step in if there is something unclear to the participant. He also has the possibility of creating an atmosphere of trust. Because the people being called don't have time to prepare for such an interview and have no possibility to postpone such a call, they normally don't want to talk too long, especially with a stranger. These restrictions lead to the acceptable length of such an interview being reduced to less than 20 minutes.[82]

Since the amount of phone interviews in the last years has largely increased, and more and more different organizations use such survey methods, the readiness of people to take part in such a survey is greatly reduced. Additionally, many organizations started to misuse the telephone interview for product selling, which had a very bad impact on the image. Lastly, this interviewing method has problems reaching a representative peer group, since the telephone book doesn't list all telephones available (unlisted numbers).

The positive side of the telephone interview lies in the reduced costs of the survey itself, since the interviewers are all sitting in the call center and don't have to travel around. This survey is also not restricted by distance from the survey center to the participants, so that the peer group can be extended to any area needed.

4.2.3 Written Questionnaires

The third large survey method is the mail interview. In contrast to the oral interview, this survey method uses no interviewer, but a written questionnaire from which the participant reads the questions and normally also writes his answers. There are different versions of this survey according to their method of distribution. The mail survey, sent as a letter; the questionnaire, which can be distributed at meetings or exhibitions or packed in a journal; or the diary, which is used to analyze something over a longer time period.[83]

Since in the written survey no direct dialogue is possible, the questions have to be formulated very precisely and understandably. Additionally, the questionnaire needs to be straightforward, and can't be as complex as in an interview. On the other hand, this survey method is almost the only one which can be realized on a full scale without increasing the costs exorbitantly.

[82] See: Kamenz(1997), p .86 et seq.
[83] See: Wyss (1991), p. 310 et seq.

One big problem of the written survey is that the response rate is mostly seen as the lowest of all methods, with response rates between 10% and 50% according to different authors. This response rate is to a large extent dependent on the content of the survey and the peer group. Over time, different methods for increasing the response rate have been developed. The most common are including small presents for the participants, sharing some survey results with the participants or introducing the survey with a telephone call. It is also possible to re-contact those people which didn't answer on time.[84]

In the written survey, one big aspect is that the participant has time to think through the answer and even get additional information, if he isn't able to answer a question right away. This normally leads to better structured answers, but also increases the amount of censorship by the participant. It is also impossible to find out who really answered a questionnaire, so that the influence of third parties can be very large.[85]

In a written survey, the interviewer can't interfere in any way, so that the appearance of the questionnaire is much more important than in an interview. Additionally a letter of content is normally included to explain the reason for the survey and some personal statements.

4.2.4 Comparison of Survey Methods

Tab. 1**Fehler! Verweisquelle konnte nicht gefunden werden.** shows a comparison of the three major survey methods. As mentioned above, each of the survey methods has its own strengths and weaknesses.

Tab. 1: Comparison of Survey Methods (Source: see Hüttner 1997, p. 77)

Method	written	phone	oral
Response Rate	-	+	+
Uniform Survey Date	-	+	+
Measurement of Answer Time	-	+	~
Drop Out of Inconsistent Answers	~	-	+
Influence from Outside	-	~	+
Extent of Questionnaire	-	-	+
Danger of Misunderstandings	-	+	+
Complex Information	-	-	+
Influence of Interviewer	+	~	-
Hard-to-reach Groups	+	~	-
Areal Representation	+	+	-
Costs	+	+	-
+ Advantage, - Disadvantage, ~ Indifference			

[84] See: Hüttner (1997), p. 71 et seqq.
[85] See: Hüttner (1997), p. 73

4.3 Question Formulation

In a written survey, the appearance of the questionnaire has to compensate for the missing interviewer who could otherwise make an interview interesting. Therefore much care should be taken in formulating the questions in a simple and understandable way.

4.3.1 Types of Questions

There are three different ways of classifying the different kinds of questions that have been developed so far. Of these ways, the classification according to the type of answer possible is the most important and detailed.[86]

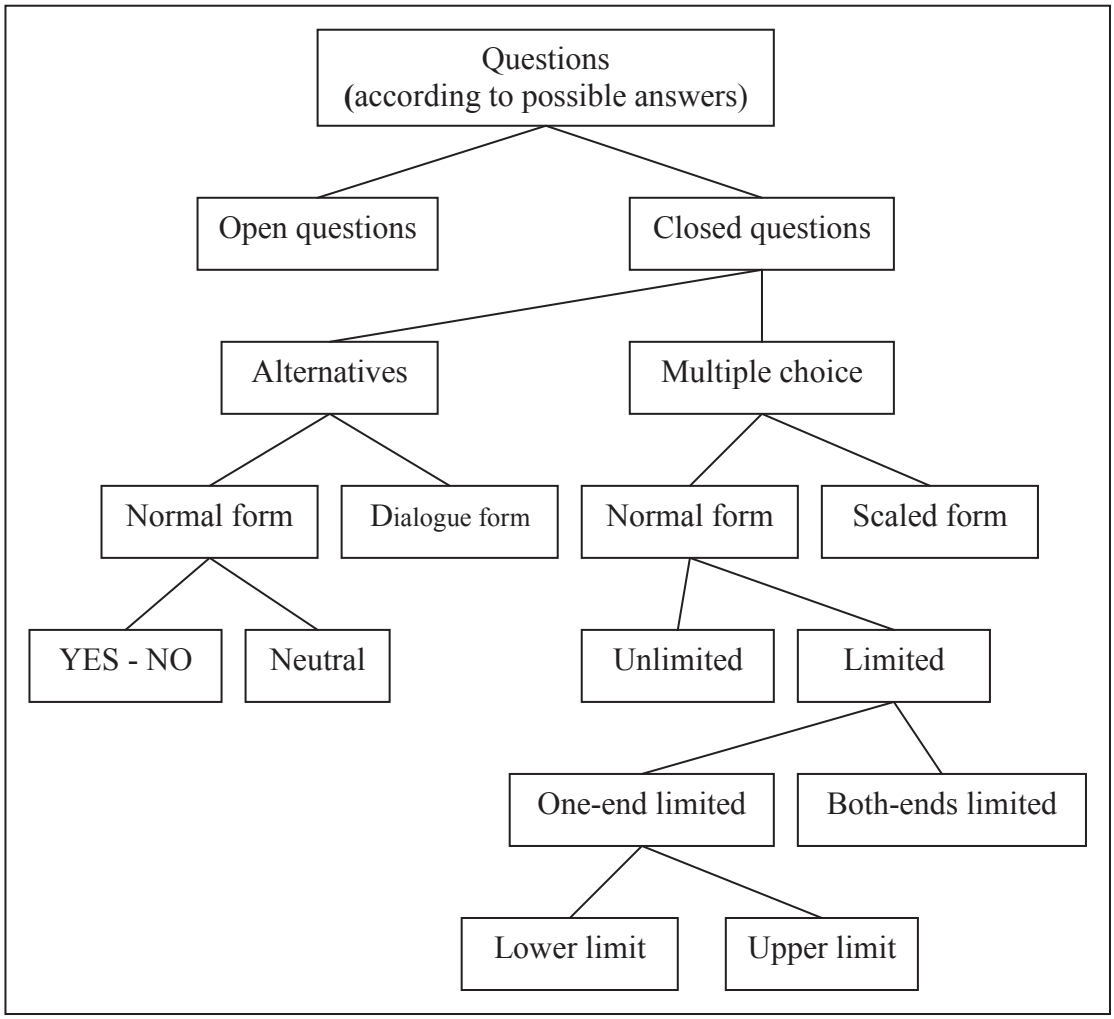

Fig. 15: Classification of Questions (Source: see Hüttner 1997, p. 100)

[86] See: Hüttner (1997), p. 99 et seq.

4.3.1.1 Open-Ended and Closed-Ended Questions

Open-ended questions are characterized by the fact that the participants of the survey have the possibility to formulate the answer in their own words. Sometimes this answer might be limited in a way by having the test person finish a given sentence with own words. This kind of question is very useful for psychological surveys, since this is the only kind of question allowing the participant to really say what they think.[87]

Because of the freedom in answering, this question can create many problems. The quality of the answer is extremely dependent to the ability of the test person to formulate their thoughts, the answer might surpass the actual asked topic, and above all, it is very complicated to codify and analyze open-ended questions. For the analysis of such questions it is useful to categorize the answers, which might be very hard if the answers don't contain any quantitative values.

Closed-ended questions, on the other hand, have a set of predefined answers. This kind of question has the advantage that it can be codified and analyzed much easier than open-ended questions. Some work has to be put into creation of the answers, as they have to cover all the answers that the test persons might want to give, and care must be taken that the different answers don't overlap with each other.[88]

To make sure that the answers are sufficient and correct, the questionnaire should pass a pre-test, in which the questions might even be open-ended, to generate the answers later on from the results. Another method to prevent missing answers is the possibility of adding an additional category to the answers, which will give the test person some room for an open answer.[89]

4.3.1.2 Alternative Questions

Alternative questions are characterized by the fact that they only offer two different options (answers like "don't know" or "no opinion" should still be included). The simplest form would be the YES-NO question. For some questions it can be useful to formulate the question in a more neutral way, which includes both answers in the question to prevent the preferred choosing of the offered "positive" answer.[90]

Example: Do you use an electric toothbrush?

O Yes O No

Example: Do you use an electric toothbrush or a manual toothbrush?

O electric O manual

[87] See: Hüttner (1997), p. 101
[88] See: Hüttner (1997), p. 101 et seq.
[89] See: Hüttner (1997), p. 103 et seq.
[90] See: Hüttner (1997), p. 105

4.3.1.3 Multiple Choice Questions

Multiple choice questions give the participant the possibility to choose from several different answers. Depending on the subject the participant will have the possibility to choose a limited or unlimited amount of answers. Since these questions give the possibility to choose more than one answer at the same time and the analysis normally contains graphs showing the percentage of participants choosing each answer, the sum of these percentages will normally surpass 100%.[91]

Example: Which add-ons does your car have?

O Airbag O ESP O ABS O fog lights …

4.3.1.4 Scaled Answers

The so-called "scaled question" is a special form of the multiple choice question, which is used if not only the existence of something is asked, but also the intensity of its existence. Four different kinds of scales are used as can be seen in Tab. 2.

Tab. 2: Data Scales and Information Content, (Source: see Kamenz (1997), p. 167)

Scale Type	Features of the Values	Information	Examples
nominal scale	A = A ≠ B	two values are the same or different	sex, eye color, blood type
ordinal scale	A > B > C	values can be ranked as: smaller/larger/ same	school marks
intervall scale	A > B > C A - B = B - C	the distance between values is known	IQ, temperature [℃, ℉], date
relation scale	A = a * B	an absolute zero point, all kinds of mathematical calculations possible	age, price, temperature [K]

[91] See: Hüttner (1997), p. 106 et seq.

Nominal scale

The nominal scale only allows the comparison of different objects, but gives no possibility to rank them.

Example: What color are your eyes? O brown O blue O green …

Ordinal scale

With an ordinal scale it is possible to rank different objects. With this scale it is possible to calculate a median or frequency distributions, but it is not possible to calculate the mean, as this is only possible if the distance between different values can be calculated.

Example: How often do you drink coffee?

O very often O often O rather seldom O very seldom O never

Interval scale

On this scale, the distance between different options can be looked at on a metrical scale. This opens the possibility of using almost all statistical methods for analyzing the data. Only the lack of a natural zero-point gives some restrictions, since divisions between different values are not meaningful.

Example: What is the temperature of your living room?

18___19___20___21___22___23___24___25 °C

Ratio scale

The relational scale, which can also be called ratio scale, can be distinguished from the interval scale by the fact that it contains a natural zero point. This scale gives the opportunity to use all known mathematical calculations for interpretation and measurement.

Example: How tall are you? ____cm[92]

[92] See: Kamenz (1997), p. 167 et seq.

5 Industry Survey

The main task of this diploma thesis was to find out how the management system audits of OMV differ from the audit systems used in other oil and gas producing companies. Additionally the auditing methods of OMV should be compared with international norms.

5.1 Realization of Survey

To compare the auditing methods of OMV with other companies, first the auditing methods of other oil and gas producing companies had to be gathered.

5.1.1 Actual Situation

At OMV the auditing of E&P structures and processes is done by the HSEQ department, which is located in Gerasdorf. This department consists of only a few employees who maintain the HSEQ management system and carry out the audits stated in the HSEQ audit plan.

Since the OMV Company recently acquired several other companies and parts of companies in its attempt to reach its production and reserve targets, the management system which was once constructed for a much smaller company has to be reviewed. To find out if the auditing methods used in the department are suitable for a company as large as OMV a master's thesis was offered.

Additionally the management system and therefore also the auditing methods were created without directly referring to an international standard. To find out if the auditing methods used by OMV E&P are comparable with those cited in the ISO19011, a comparison between those two is also required.

5.1.2 Creation of the Questionnaire

To find out how other oil and gas producing companies are handling their health, safety, environmental or quality audits a survey was initiated. This survey should deliver feedback about the auditing habits among other middle class international petroleum companies.

The first task was to create a questionnaire to gather the required information without offending the companies being surveyed. The final questionnaire can be found in appendix A.

Therefore I started some interviewing sessions among OMV employees who already had experience with HSEQ audits. These interviews had the target to find out what were important features and aspects of auditing quality. From these interviews, some basic aspects important to characterize the quality of an audit were derived.

These aspects are:

- Qualification of the audit team leader
- Qualification of auditors
- Auditing reference
- Certifications of auditing department
- Communication of audit findings
- Controlling of follow-up procedures

Additionally some general information about the auditing process in other companies should be acquired, to increase the significance and comparability of the expected survey results. So additional information had to be acquired:

- Why does a company audit their processes at all?
- Who are the stakeholders and initiators of audits?
- What parts of the company are audited?
- Does the auditing department use special computer software for auditing?
- How many audits are done, and of what kind?

With this information a first draft version of the questionnaire was created. This questionnaire contained all the necessary questions to answer the topics mentioned above, but was very complex and long.

In a group meeting, where most of the HSEQ employees were invited, the questionnaire was presented and discussed. During this discussion, several of the questions were replaced by better ones, and others were dropped completely. One of the findings during this meeting was that the time for filling out the questionnaire was a main aspect for the expectable response rate, since the survey should be carried out by lead auditors in other companies, which don’t have much spare time during their working hours.

After the meeting several improved versions of the questionnaire were created. After finding an acceptable structure and length of the questionnaire, an internal test was done to find out how long it would take to answer the questionnaire, and to get directly comparable information about OMV auditing.

After the internal test, another meeting was held, to discuss how the response rate for the upcoming survey could be maximized. Since the peer group given by OMV was rather small, a high response rate was essential to gain meaningful information out of the survey. The peer group in this content is a group of E&P companies selected by OMV as desirable participants in the survey. During this meeting the following points were fixed:

- To ensure the university character of the survey, the questionnaire should be sent out via the university e-mail system.
- To reduce the chance of misunderstandings, an explanation sheet was included in the survey.
- To get the e-mail addresses of possible survey candidates, and to introduce the survey, the companies in the peer group were contacted by telephone. This call was also used to introduce the survey and hopefully increase response rate.
- Since the survey took place around Christmas, the survey candidates should be reminded of the survey by an additional telephone call after the holidays.

5.1.3 Description of the Survey Questions

To compare the different answers, and to correlate the results of the survey with company size, the participants of the company had to include their company name in the questionnaire. However in the analysis itself, all data given are anonymous.

To get an impression of the reasons behind the auditing process at different companies, the first real question was about the auditing philosophy. Linked to this theme, the next question is about the stakeholders of auditing. This is to find out if the audits are done for internal reports, or are initiated by external groups of interest.

In the third question the qualification of auditors and lead auditors is targeted, since this is a main aspect of auditing quality.

There are three different kinds of audits, which are mostly linked to the initiator of an audit. These kinds are the first party audit, which is commissioned and done by the own company. The second party audit is mostly used to survey other companies in the supply chain, while the third party audit describes the certification audits done by accredited auditing companies. Since internal audits are not very reliable for high level reports, the kind of audits done in a company can give good evidence who wants to look at the results.

Question 4.3 reflects the different parts of an E&P company. Since the information gathered by this survey should be comparable, it is very interesting to know what parts of the company have HSEQ audits. The topics mentioned in this question reflect the most important parts of the value chain of petroleum companies. If an E&P company wants to produce oil and gas, the first task is to find a reservoir. This is done by seismic surveying of subsurface formations. When promising formations are found, some exploration holes are drilled, and afterwards the production department has to plan and operate the wells which are used for the production of oil and gas.

Different companies use different references to create their auditing criteria. Some of the more important references are:

- EMAS: a voluntary environmental management system used the European Union
- Responsible care: a worldwide voluntarily initiative of the chemical industry to improve their health, safety and environmental performance independent of any legal requirements.
- OHSAS18001: an international standard for occupational health and safety management systems
- ISO9000: the quality management system standard
- ISO14001: the environmental system standard

Question 4.4 is used to find out if the audit criteria are based on any international norm, or if they are completely self-made. The following question then deals with the question, if the norm is only used as reference or also for certification of the company.

In some companies, there might be so much work with auditing that special auditing software can be useful for the processing of audits, while other companies create their own auditing software or use no computers at all. The answers to question 7 give some insight into the amount of work and computing a company invests in their auditing.

5.2 Response Rate

Tab. 3: Companies Surveyed

Company	Country	Proved Reserves (billion BOE)[93]	Employees
Anadarko	United States	3.10	5,200
Apache	United States	2.31	3,150
BG	United Kingdom	2.15	4,766
BHP Billiton	United Kingdom	1.36	38,000
BP	United Kingdom	1,240.00	97,000
Canadian Natural	Canada	1.95	3,700
El Paso	United States	0.39	1,000
ENI	Italy	7.22	70,348
ExxonMobil	United States	22.70	82,100
Norsk Hydro	Norway	1.92	33,218
OMV	Austria	1.29	40,993
Santos	Australia	0.82	1,679
TOTAL	France	11.10	14,862
Woodside	Australia	1.19	2,888

For the survey, the questionnaire was sent out to a peer group of 41 companies. To provide a representative survey, the companies of the peer group were distributed worldwide (see Fig. 16). The Chinese and Russian companies probably didn't answer because of language problems. Most of the other companies that didn't take part replied that their company rules forbid the involvement in surveys like this one. The European peer group consisted mainly of companies from the United Kingdom and Norway.

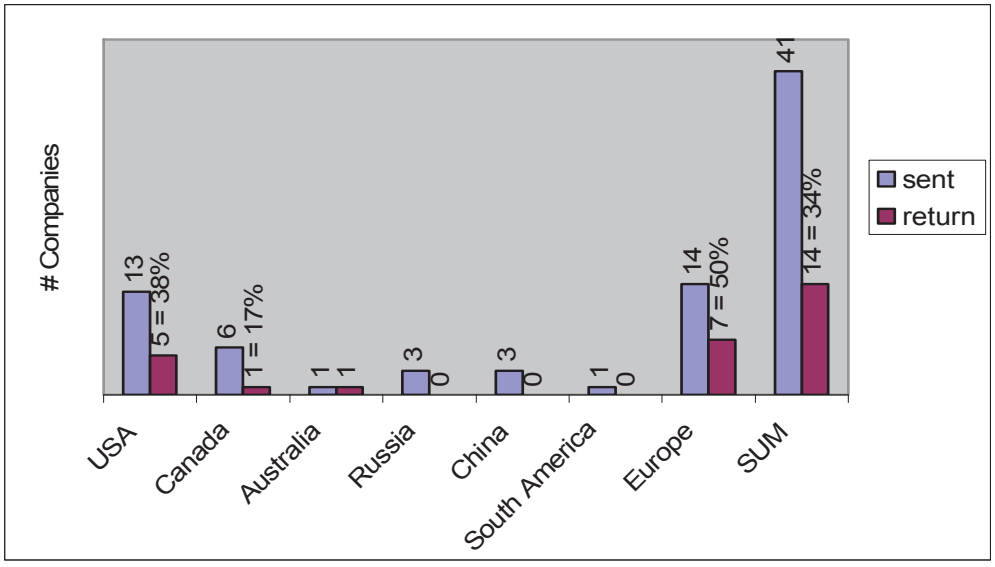

Fig. 16: Feedback

[93] Source: See Annual Reports 2006

Due to the small peer group, the number of respondents (see Tab. 3) was rather low, even if a response rate of 34% is a very good result for a written survey. Unfortunately the communication problems with the Asian companies were too large, so that they didn't respond to the survey. Therefore the companies taking part in the survey are concentrating in some European countries and non-European English-speaking countries.

5.3 Overview

In the survey most questions are formulated in such a way that multiple answers are possible. Since almost every participant choose more than one answer at each question, the data shown in the analysis will normally sum up to more than 14, which is the number of participants.

The first task was to find out what motivates companies to do audits. As can be seen in Fig. 17, every company wants to control its compliance with internal rules, and most use audits to communicate their best practice within the company. Only 50% of the companies additionally want to comply with certificates. Reputation was only cited rarely. Among others, risk management and protection of the employees were cited.

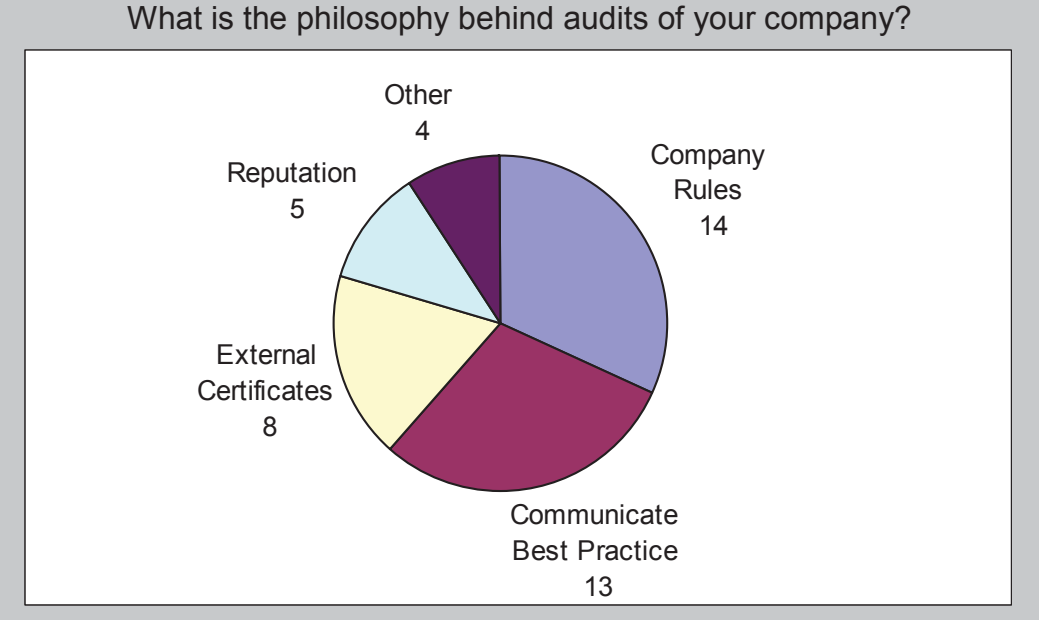

Fig. 17: Auditing Philosophy

The second part of the question deals with the stakeholders of auditing (see Fig. 18). Line management, top management and the HSEQ organization rank in the top positions, with 9 companies mentioning all 3 of them. Employees and analysts are only cited seldom. Among others, public opinion, consultants and clients were cited. Since none of the companies marked NGOs as stakeholders, it can be assumed that these organizations are rather unimportant as far as auditing is concerned.

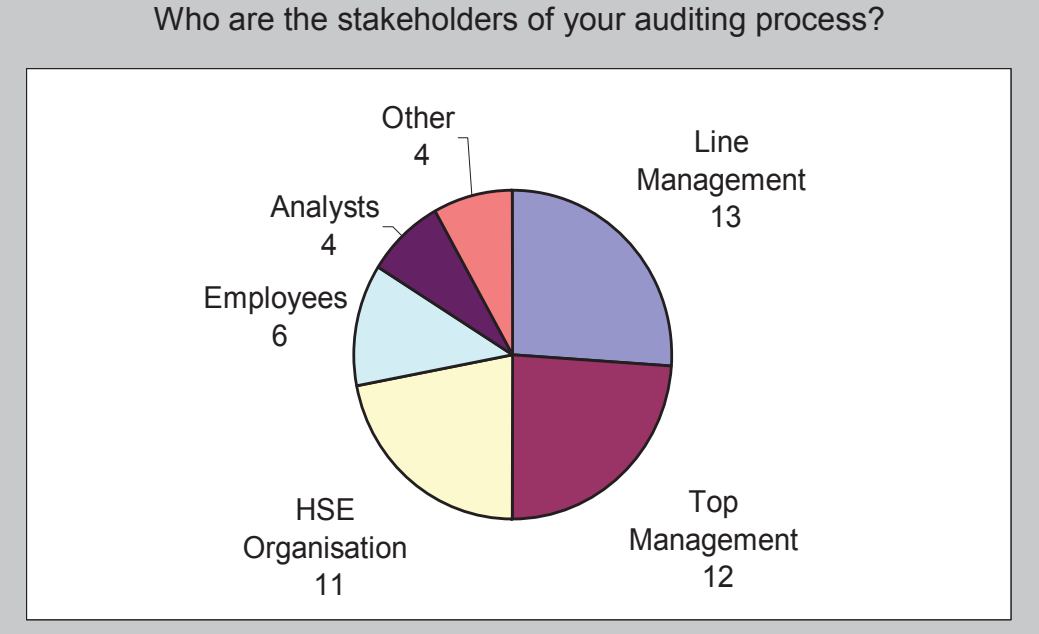

Fig. 18: Auditing Stakeholders

The third question deals with the training and experience of auditors and audit team leaders. For the two sub questions, one replier cited that his company has no clearly defined prerequisites, so that the analysis will deal with only 13 answers.

Every company states that experience is a must for its audit team leaders, and most of them also require formal training. Those three companies not ticking management or operative experience stated in their additional requirements that their employees must have some other kind of experience. Regarding experience, only half of the participants cited a specific number, which varies between 5 and 10 years. Some 50% of the companies state that their team leaders have to take part in several audits before being promoted, with most talking about 10 audits.

Those few companies asking for certificates want their employees to have national or international auditing certificates. At least 4 companies additionally asked for some soft skills like communication and presentation skills.

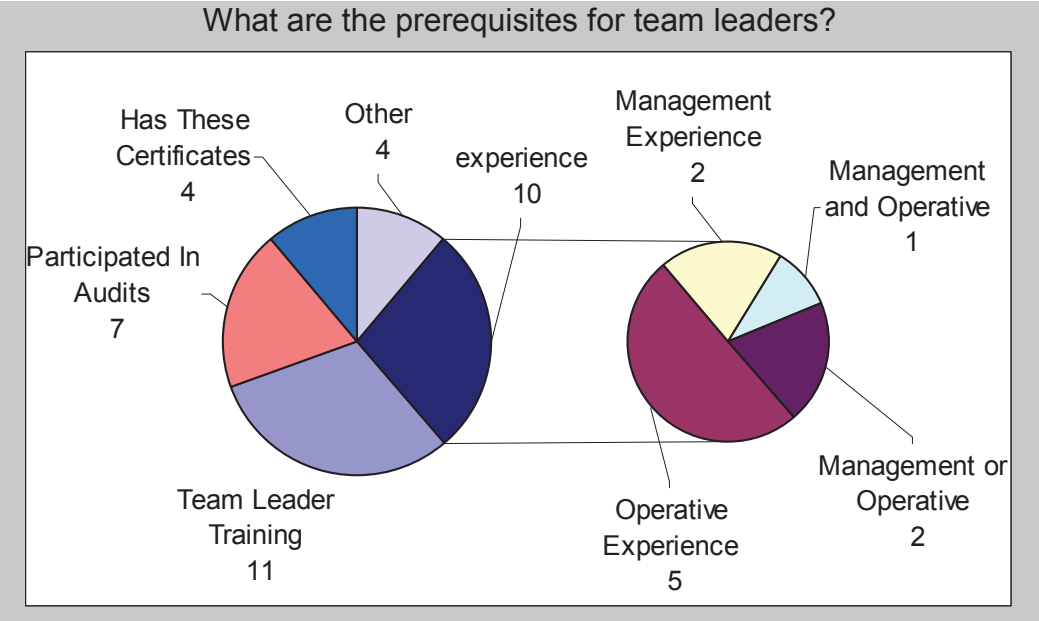

Fig. 19: Audit Team Leader Requirements

The prerequisites for audit team members can be seen in Fig. 20. Also one company has no written prerequisites, but conducts long briefing sessions to train its team members in interviewing skills.

Most companies believe that their members must have working experience of about 5 years for such a job. Half of the companies believe in the power of nominal training courses. Those companies not asking for formal training have internal training sessions or include experts for special topics in their teams. Two companies cited expertise in the auditing topic, while some cited no specific requirements at all.

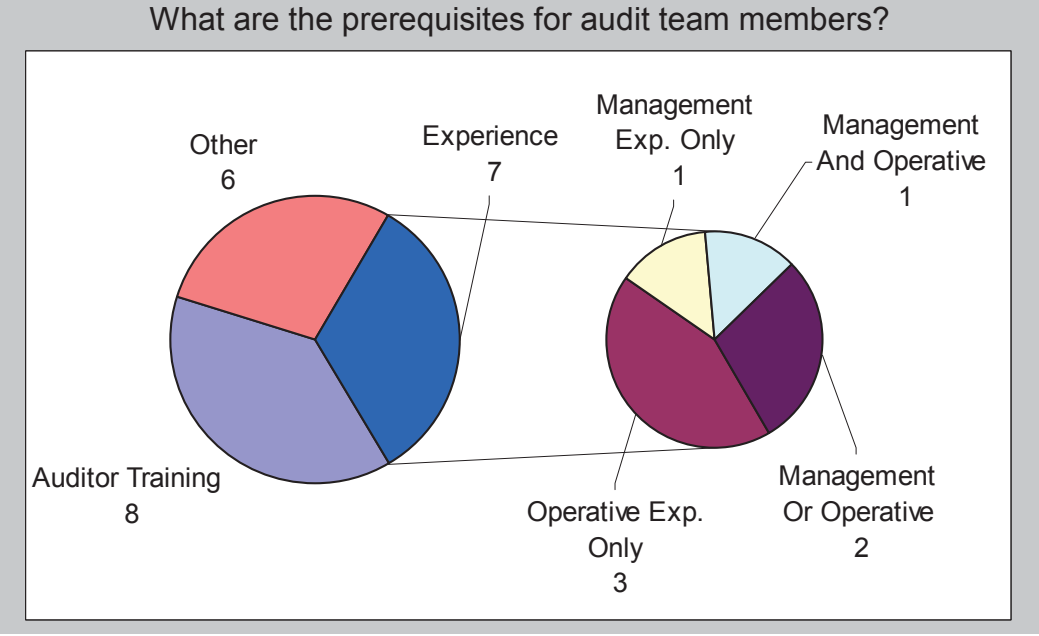

Fig. 20: Prerequisites for Team Members

When dividing audits by the relationship between the auditor and the auditee, there are three different kinds of audits. First party audits can be seen as internal controls, where employees audit their own department. Second party audits are audits within a company, but with auditors independent of the audited department. Finally third party audits are external audits, which are normally conducted by accredited auditors and often have the goal of showing the compliance of a company with the requirements for certificates.

Asked for the kind of audits conducted in a company, one company uses external audits only, while all other companies rely on internal audit teams with additional help from external auditors.

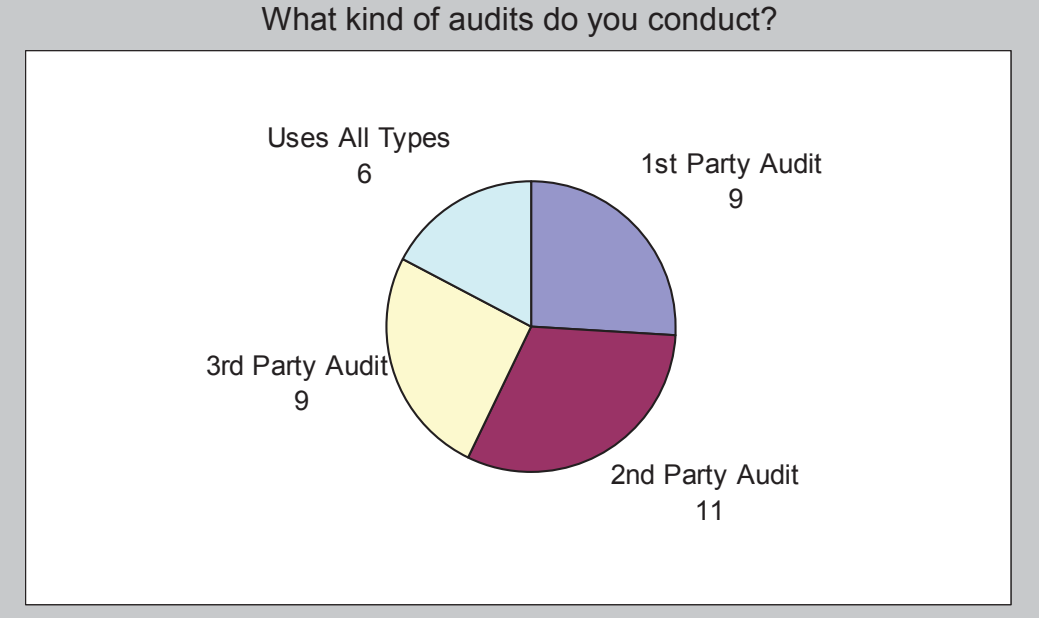

Fig. 21: Kinds of Audits Done

The next figure shows the amount of audits done by each company per year. As can be seen, the majority of the participants conduct less than 20 audits per year. There are only two companies which do significantly more audits, and two companies unfortunately didn't answer this question.

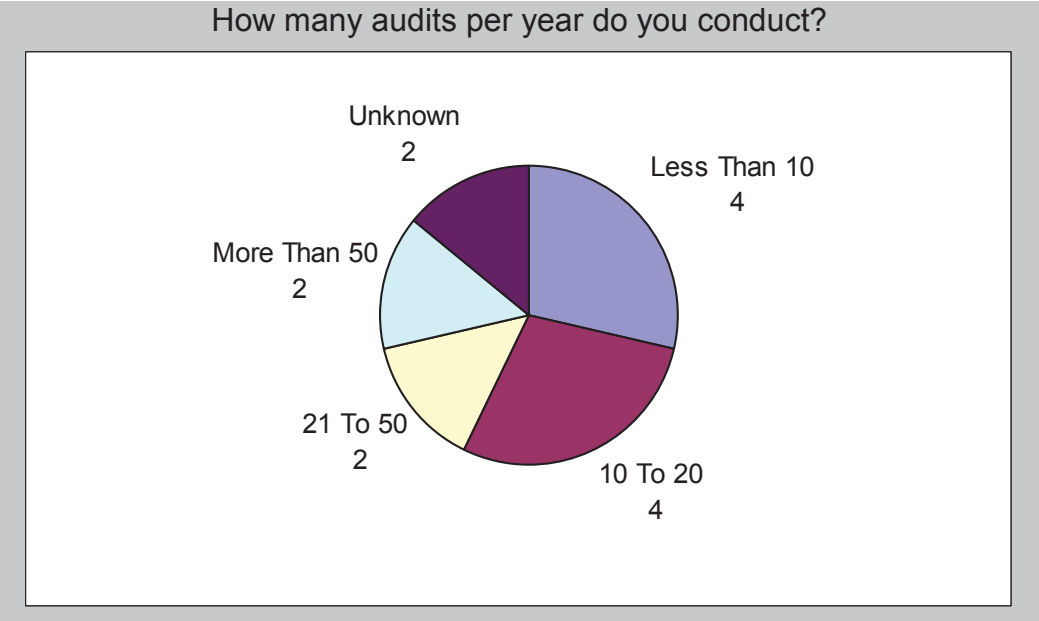

Fig. 22: Number of Audits

To find out what divisions are being audited, the question shown in Fig. 23 listed some of the possible targets. The answers indicate that 9 companies audit most if not all aspects of their business, while the rest only audit 2-3 aspects. One company especially concentrates on business units only, while some additionally cited auditing their waste facilities and contractors.

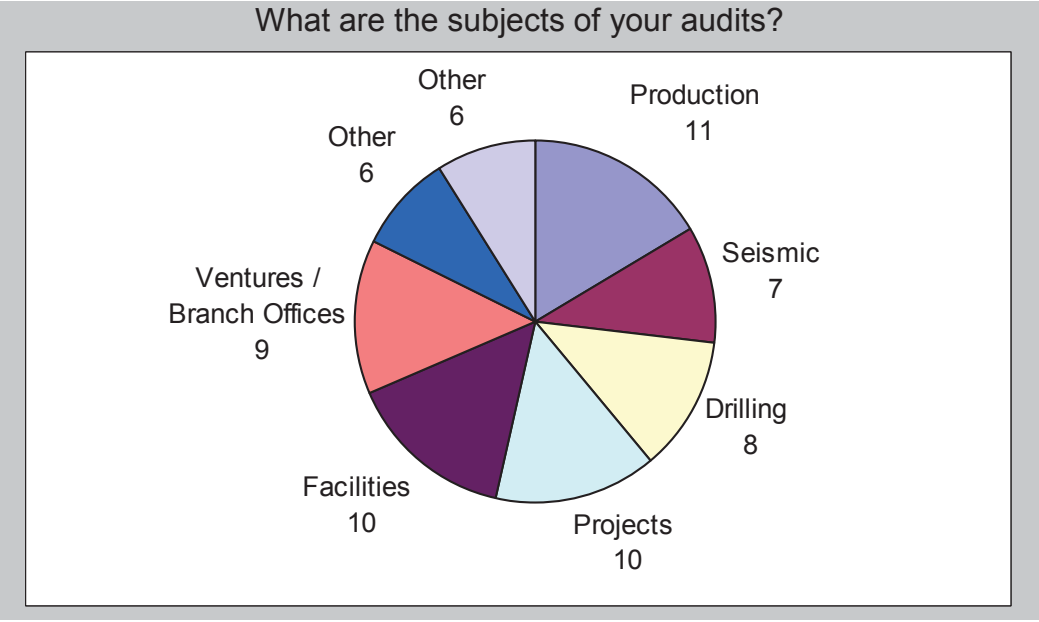

Fig. 23: Subjects of Audits

The reference for auditing was asked in this question, to find out more about the kinds of audits done. The answers given are: ISO 9000, which deals with management quality; ISO 14000, the standard for environmental management; and OHSAS 18001, which deals with occupational health and safety. The two systems not used by the departments asked are responsible care, which is a voluntary development of the chemical industry to environmental and occupational risk: and EMAS, a European standard for both eco-management and eco-audits.

Every company uses its own HSEQ management system as a reference. Most of the companies refer to ISO 14000 and ISO 9000 or OHSAS 18001. Only 4 companies use their HSEQ system as the only reference, and ISO 9000 and OHSAS are never used without ISO 14000. Three of the companies taking part in this survey cited that they use both ISO norms and OHSAS as reference for their auditing.

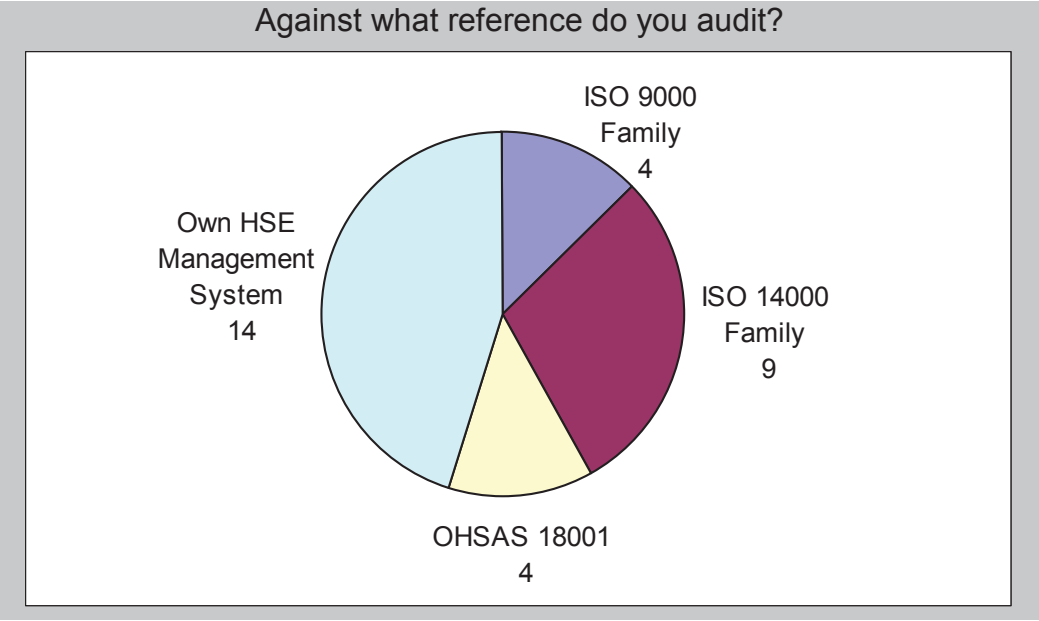

Fig. 24: Reference of Audits

After asking for the reference of auditing, it is very interesting to see how many of the companies actually possess a certificate for the standards they are using for auditing. The first thing that can be seen here is that several of the companies don't possess any of these certificates. Actually, there are only five companies possessing the ISO 14000 certificate. One of these companies indicated that they also have the OHSAS certificate. The last company remaining drops out of this group completely, since the department involved in this survey has none of the certificates cited, but is licensed as accredited auditor.

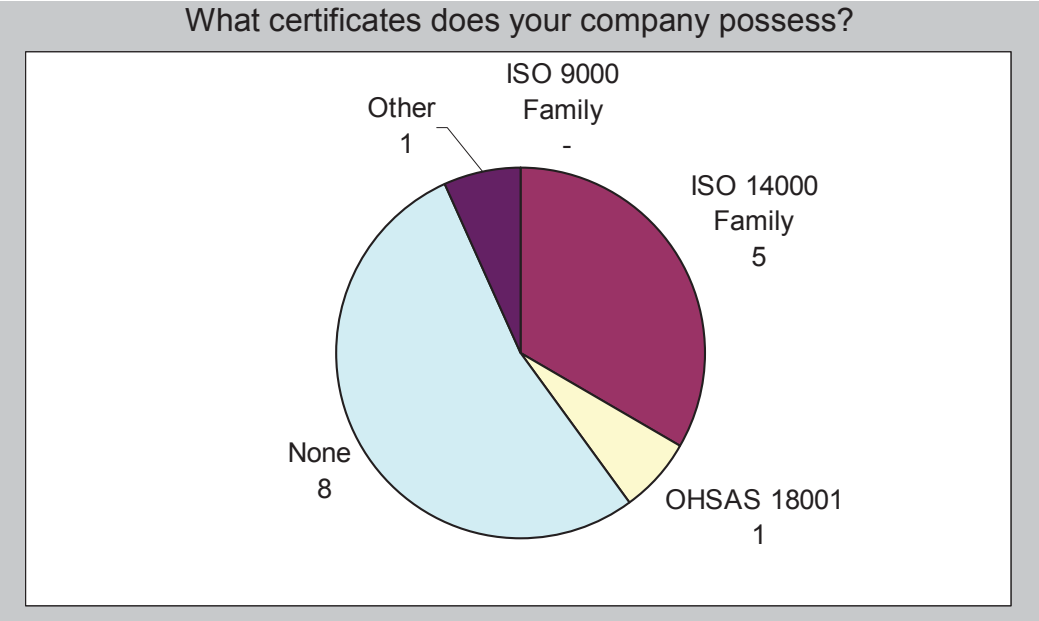

Fig. 25: Certificates

Even nowadays, some companies indicated that they process audit findings without the aid of computer software. Exactly half of the participants compute their audit findings with standard office software, while some of the others rely on their auditing software. But there are also two companies which use auditing software together with office software to compute and document their audit findings.

For the question in which way audit findings are analyzed, four companies replied that they analyze their audits only qualitatively. All the other companies cited that audit findings are analyzed both with verbal feedback and stadistically.

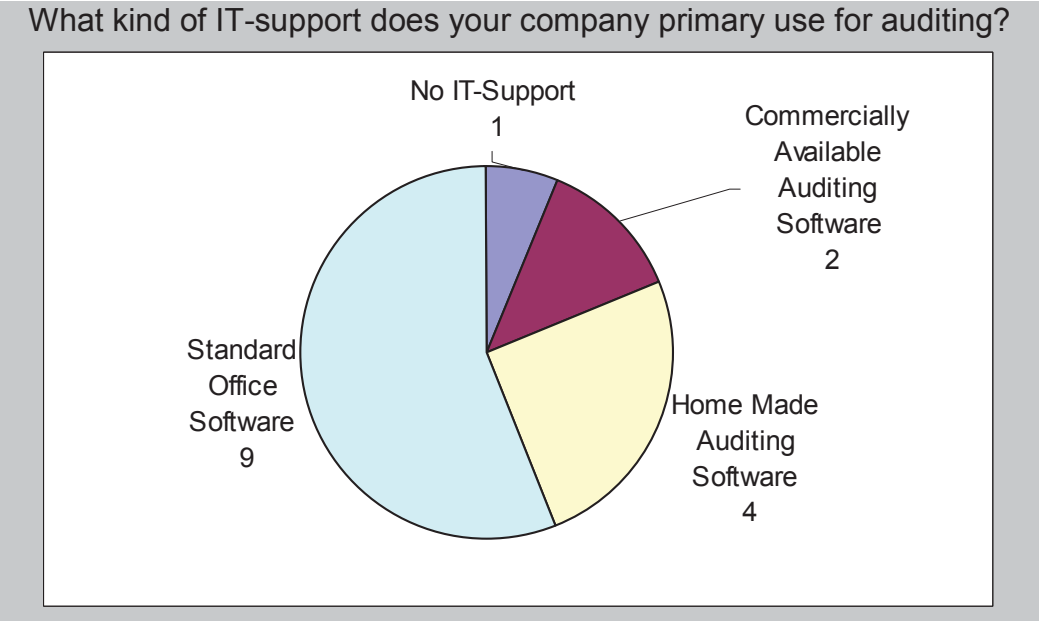

Fig. 26: IT-Support

The follow-up procedures of audits differ very much. In most companies, an audit report is sent to different departments within the company. Some prefer to communicate the audit findings to the auditee via a presentation or discussion in a meeting. Periodical reports and action plans are rather unusual for communication of the findings (see Fig. 27).

In one company the findings are not directly communicated to the auditee by the audit team but rather by the line management.

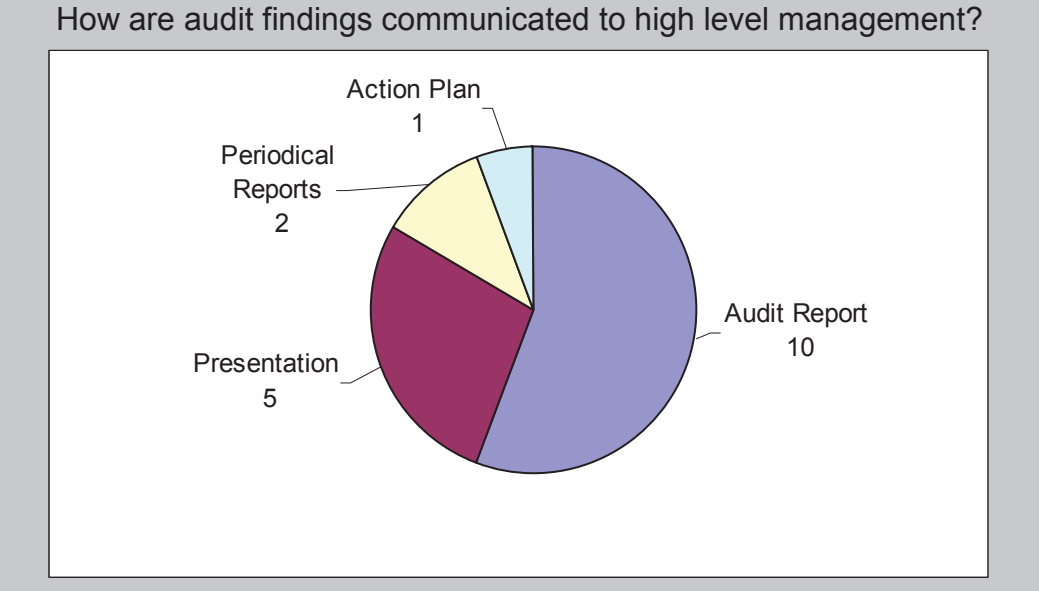

Fig. 27: Communication of Findings

To control the follow-up procedures, tracking software, action plans and periodical reports are used by several companies (see Fig. 28). In some cases, the auditee management has to take responsibility for the correct follow-up procedures, and two companies ask the lead auditor to control the whole process. The two companies using periodical reports for communication also use these reports to control the follow-up.

Since one department has just started with system audits, they don't have a fixed plan yet.

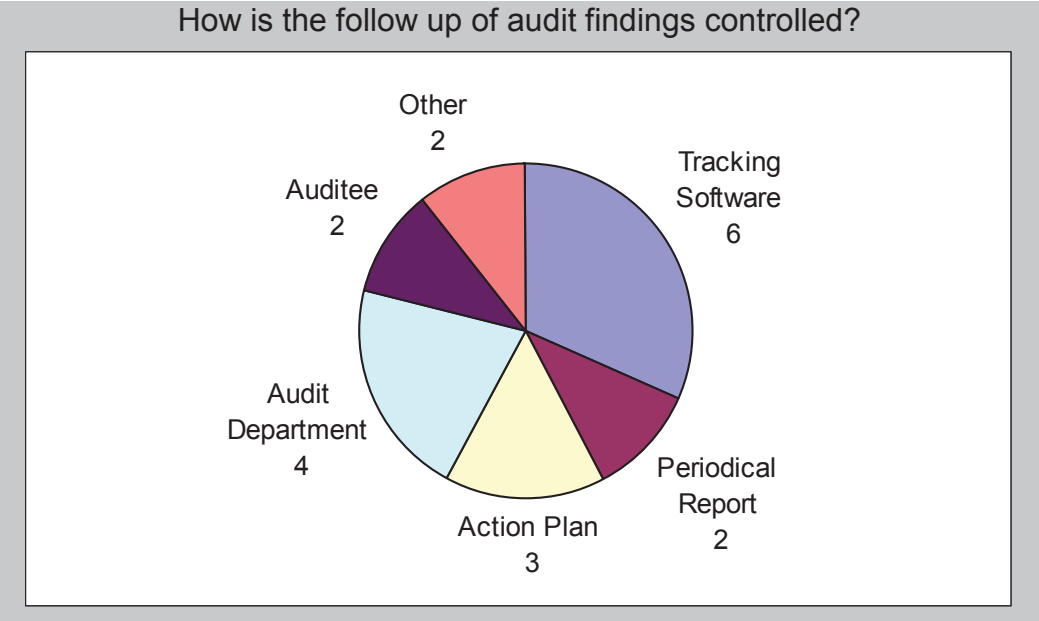

Fig. 28: Control of Follow-Up Procedures

5.4 Detailed Analysis

For a more detailed analysis, the companies have been divided into 3 groups according to their number of employees. These groups are:

- Small: less than 5.000 employees (6 companies)
- Medium: between 5.000 and 40.000 employees (4 companies)
- Large: more than 40.000 employees (4 companies)

In this part of the analysis, the primary focus will be on finding differences between the groups. Another task in this chapter will be find out how the facts found in the questionnaire can be linked together. To make the graphs better understandable, all numbers used in the following analysis are normalized to percent, by dividing them by the quantity of group members.

5.4.1 Auditing Philosophy and Certificates

The graph below shows that there is not much difference in the philosophy of auditing between the different groups. All of them use internal rules, and almost all of them want to communicate their best practice between different departments.

In the middle group only one company concentrates on reputation as a driving force for its audits, while all others take the first three arguments. Additionally environment and employee protection is important to one of them, while another cares about consistent worldwide.

In the group of the large companies the differences between the philosophies are the greatest, since every company has different priorities. One only looks at the internal rules and best practice, while another cares about every single aspect in its attempt to become leader in the business sector.

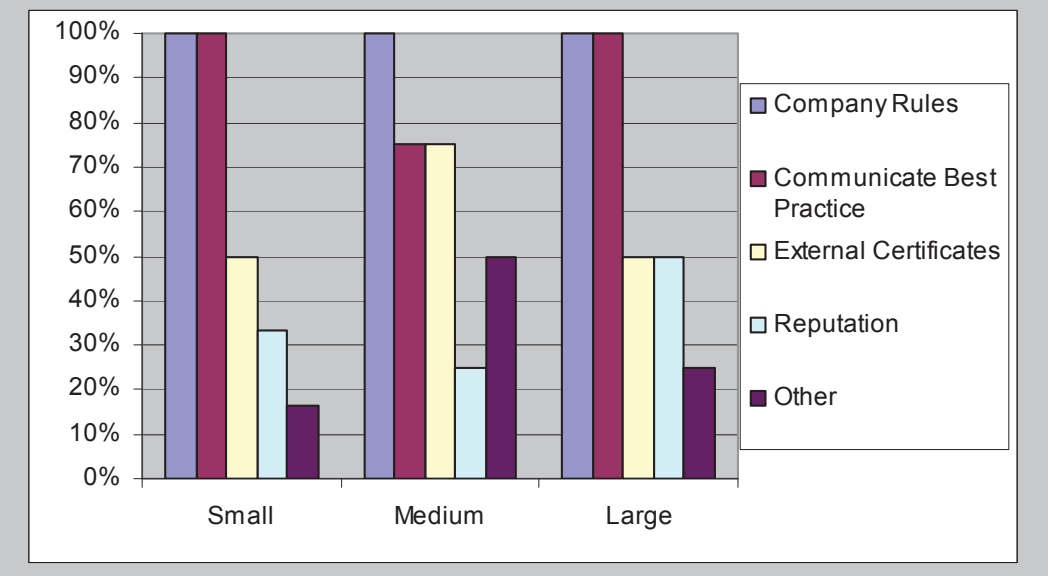

Fig. 29: Detailed Auditing Philosophy

According to the data shown in Fig. 30 and Fig. 31 many companies use ISO14000 as an auditing reference, but only within the group of large companies are several actually possessing this certificate.

Within the group of small companies, three use more than their own HSEQ management system as auditing reference. Within those, one company uses all shown standards as reference. Also certificates seem to be less important within this group, since only one company possesses an ISO14000 certificate. The second company possessing a certificate slightly drops out of the frame, since they are accredited safety auditors.

In the middle group, standardized auditing references become more important, but still there is one company which doesn't use them at all. Both certificates in this group are in the hands of one company, which of course strongly relies on those standards for their auditing.

The big companies are the group that seems to care most about standards, since only one company doesn't use them as reference. Also three out of four companies possess an ISO14000 certificate, so that seems to be more important once a company reaches a certain size.

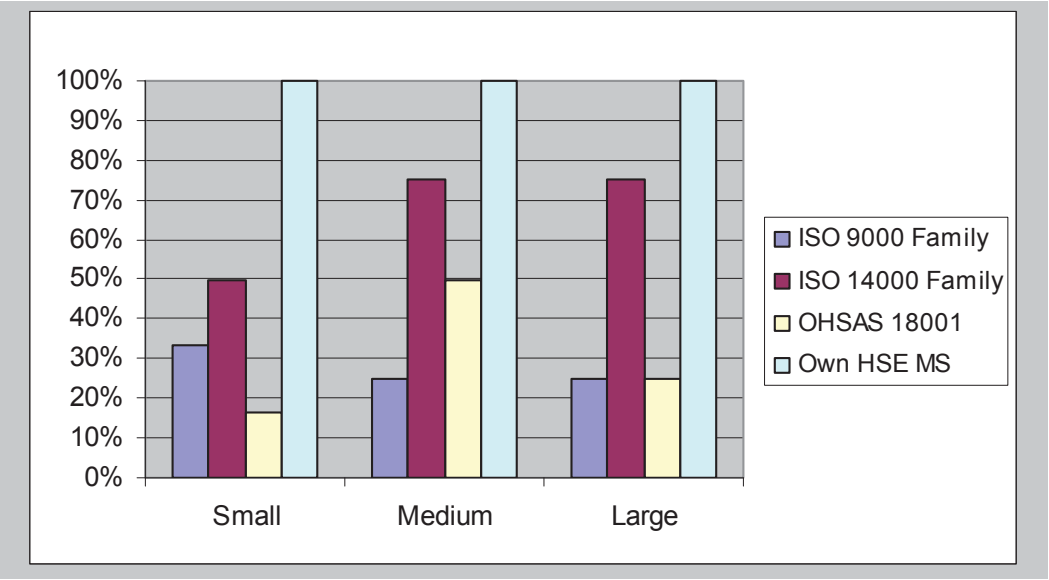

Fig. 30: Auditing Reference Details

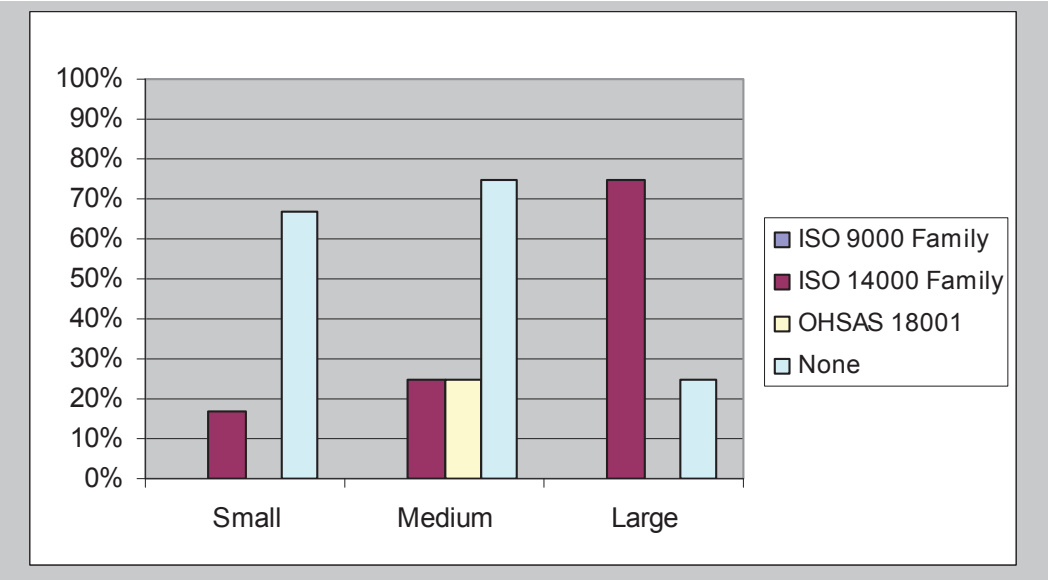

Fig. 31: Certificates Possessed

5.4.2 Auditor Qualifications

The qualification requirements for lead auditors seem to follow a trend from lower qualification to higher qualification according to the size of the company.

Among the small companies, lead auditors are generally required to have formal training and not more than 5 years of working experience, which can be either of operative business or of the management but with focus on the operative side. Only one company requires practical auditing experience of their candidates. Since one of the companies in this group is just developing its auditing system, it doesn't have any formal requirements yet, relying on the experience of the people in charge of this job.

Within the middle group, the trend significantly shifts from theoretical training to practical experience. Only two out of four companies require formal training, but three companies want their candidates to have up to 10 years of operational or management experience. One company even requires 10 years each of operative and management experience. Also the amount of auditing experience in this group is much higher, since those companies requiring it want the candidate to have at least 10 or in one case even 20 audits before becoming a lead auditor.

In the large group the requirements for lead auditors are again a bit higher than in the other groups. Formal leader training is a standard, and two of the companies even request their employees to be certified auditors. In one of the companies, working experience in either operative or management position is required, but more emphasis is laid on their personal skills, e.g. interviewing and communication skills. On the other side, there is one company which asks for up to 20 years of management and operative experience while almost ignoring the practical experience from previous audits.

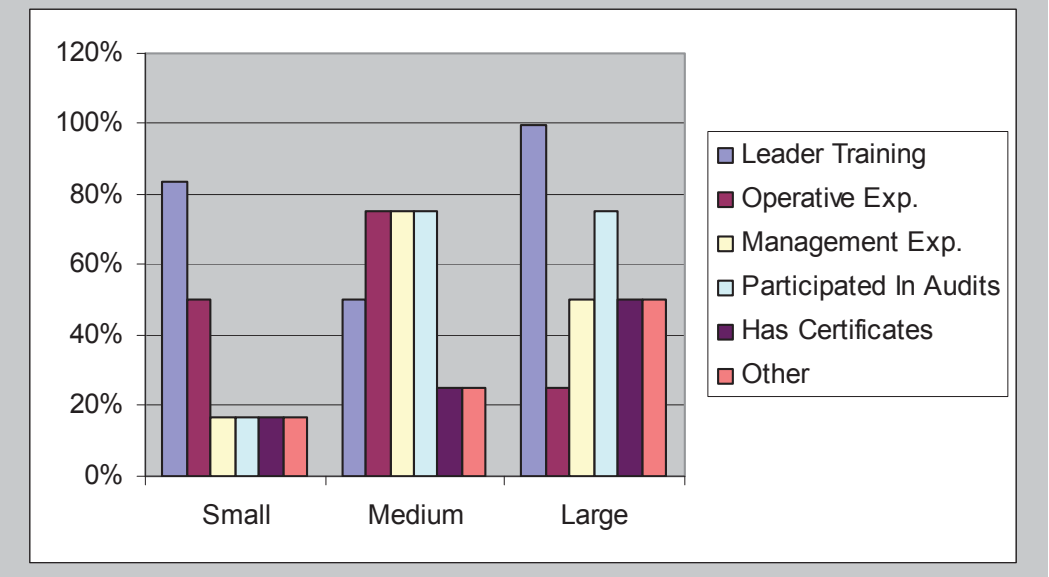

Fig. 32: Lead Auditor Qualification Requirements

When comparing the requirements of lead auditors with those of the normal team members one can find that there are some irregularities in the requirements in the small group. It is also evident that formal training is less important than for team leaders.

In the small group, one of the companies requires their employees to pass a formal auditor training and have some operative or management experience before working in an audit team. This is in strong contrast to their requirements for team leaders, which only have to pass the team leader training without any working experience. For the other small companies, primary operative personnel are required for auditor positions. In some cases they also have to know the underlying management system in order to start their work as auditors.

In the second group, internal training or expert knowledge of the audit topic is the most important issue for the choice of auditor. The amount of working experience is not too high with only 5 years each in one company and 5 years of operative experience in another. Two of the companies rely on general experience or internal trainings.

In the group of large companies the difference between the requirements for auditors and team leaders is quite large, since three of them only ask for formal auditing training, while the last one asks for some experience in the work field. Additionally in this group employees from any department seem to be able to become auditors, since only one company wants them to have expertise in the audit topic.

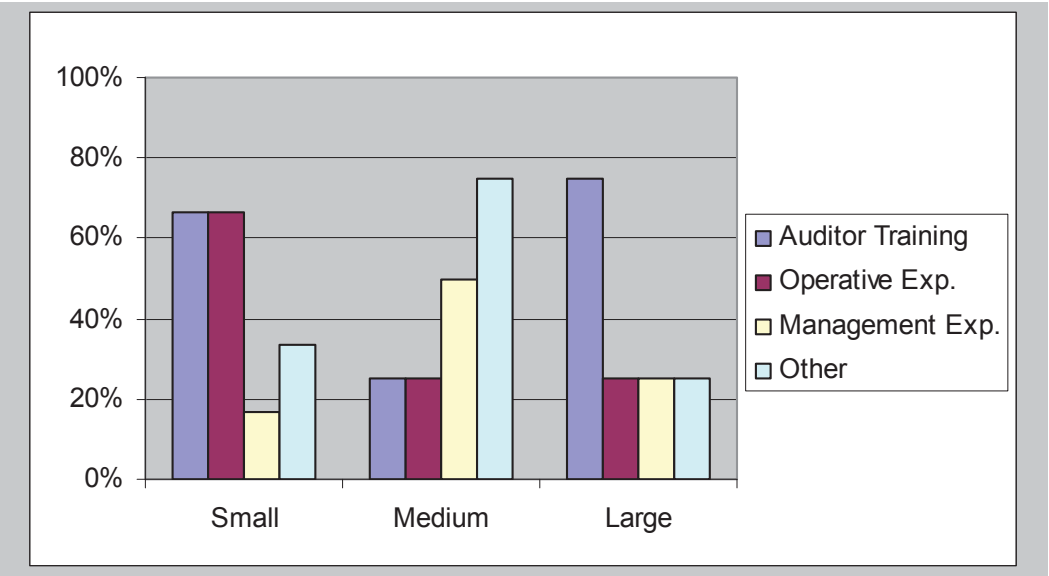

Fig. 33: Audit Team Member Qualification Requirements

5.4.3 Kind of Audits

Fig. 34 seems to show that larger companies are more willing to conduct several kinds of audits.

In the small group, most of the companies only conduct two kinds of audits. There is only one company that uses all three kinds of audits which might be due to a rather small auditing department, since this company also does less than 20 audits per year. The other company dropping out of the evaluation in this group is one that conducts only 1st party audits, but has an accredited auditing department that does more than 50 audits per year.

In the middle group, the companies fall into two subgroups. Two companies that work on many audits each year include all three kinds of audits in their work, while the others have only few audits, and those are mostly done by external groups. This circumstance might also explain why exactly these two companies also have the highest requirements for auditors and team leaders. A characteristic in this group is that increasing company size denotes fewer audits for the interviewed department, which might mean that the audits are spread out between different departments.

In the large group, the company doing the fewest audits is also the only one concentrating on 2nd party audits. In this group the trend of the previous group is reversed, meaning that the amount of audits done by their HSEQ department increase with company size. This might indicate that in large companies auditing is once again confined to a few or even a single department, in order to increase quality of the auditing process.

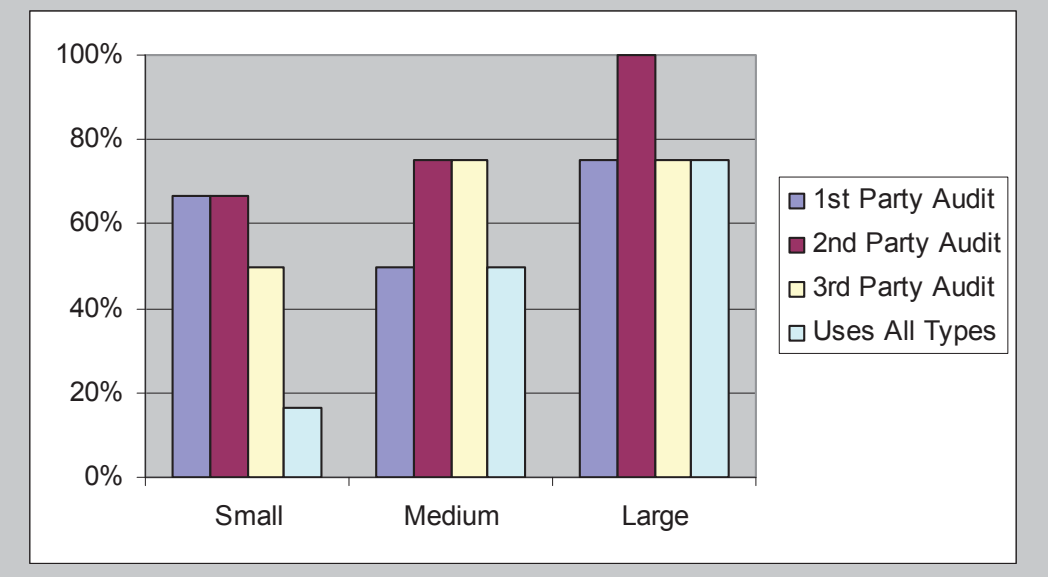

Fig. 34: Kind of Audits Used

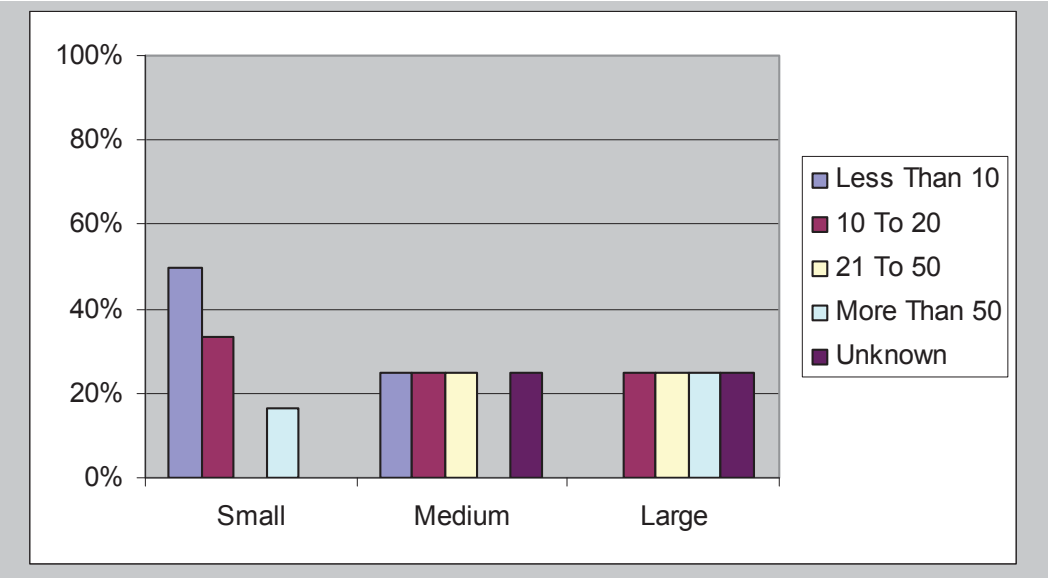

Fig. 35: Number of Audits per Year

5.4.4 Topics and Stakeholders

Fig. 36 primarily shows that next to the line and top management, which seem to be the most important stakeholders, the amount of other internal stakeholders slightly decreases with increasing company size. On the other hand, the number of different topics for auditing increases with increasing company size.

Most of the small companies have their employees and the HSEQ organization as stakeholders in addition to their management. The analytical department is not very important for audits, and only one company sees its clients as stakeholders for auditing.

One of the medium-sized companies defines all internal departments and the public as stakeholders for its auditing process, while the rest of the group concentrates on management and HSEQ department for their reporting.

The large companies, again, concentrate on their management for reporting, but some of them additionally communicate their audit findings to their employees. External groups are not cited, except for contractors who are also part of the auditing process.

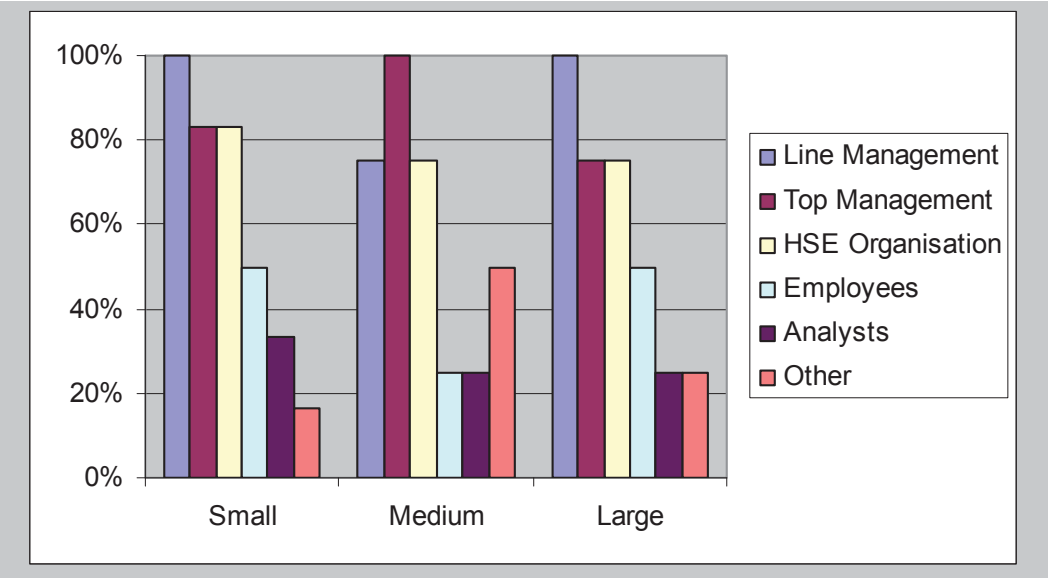

Fig. 36: Stakeholders of Audits

The auditing among the small companies concentrates on operation critical topics. Production process and facilities are important to almost every company in this group. Projects and drilling are next. Only one company completely drops out of the scheme which divides its audits by business units rather than topics.

In the middle group, the topics for auditing are more diverse, with one company auditing everything but seismics and projects. Even labs and waste disposal facilities are included. Yet another company only concentrates on seismics. For the last two companies, seismics and drilling seem to be less important.

In the large group, the fact that the companies audit almost everything is very noticeable, but one company added that it hasn't decided which of the topics will be used. Logistics, waste and radioactivity were cited as additional topics in this group.

The distribution of auditing topics reinforces the theory that the companies in the middle group concentrate their auditing efforts on topics most vital to their success. Large companies can afford to audit every aspect of business or have integrated different departments into an overall management system, which reduces the amount of work needed to audit them all, since the auditing procedure would be very similar for all departments.

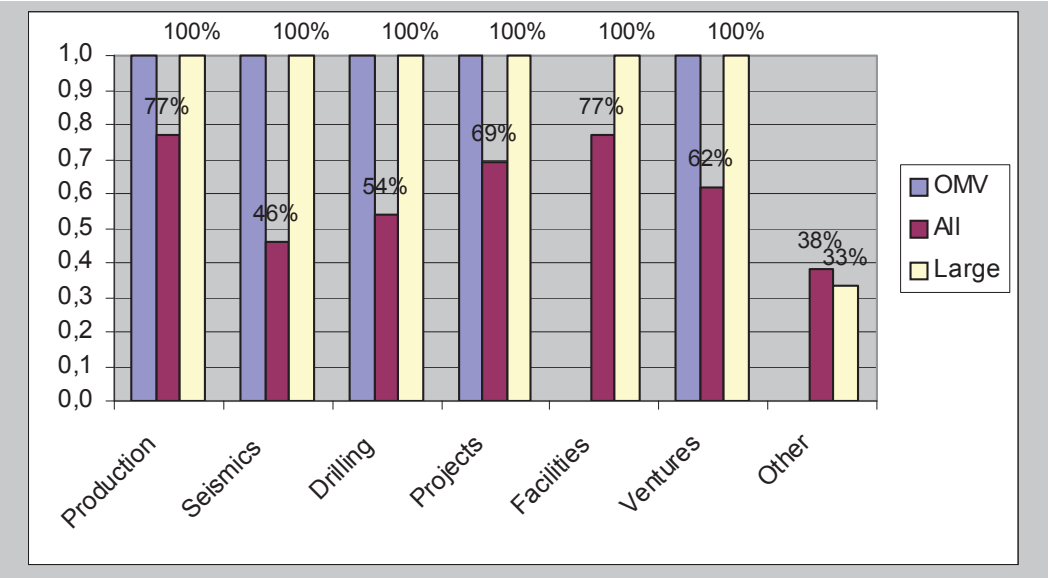

Fig. 37: Topics of Audits

5.4.5 Audit Processing

When looking at the post-processing of audits (see Fig. 38), it is evident that larger companies are more likely to have complex rather than standard auditing software.

While small companies tend to process audit findings with standard office software, some of the medium companies include auditing software into their process. Most of the large companies have decided to develop specialized auditing software and use office software only as addition (see Fig. 39).

It is also evident that half of the small companies interpret their audit findings quantitatively, while the rest rely on qualitative findings only. Almost all the larger companies use qualitative and quantitative audit findings, which might increase the significance of the results.

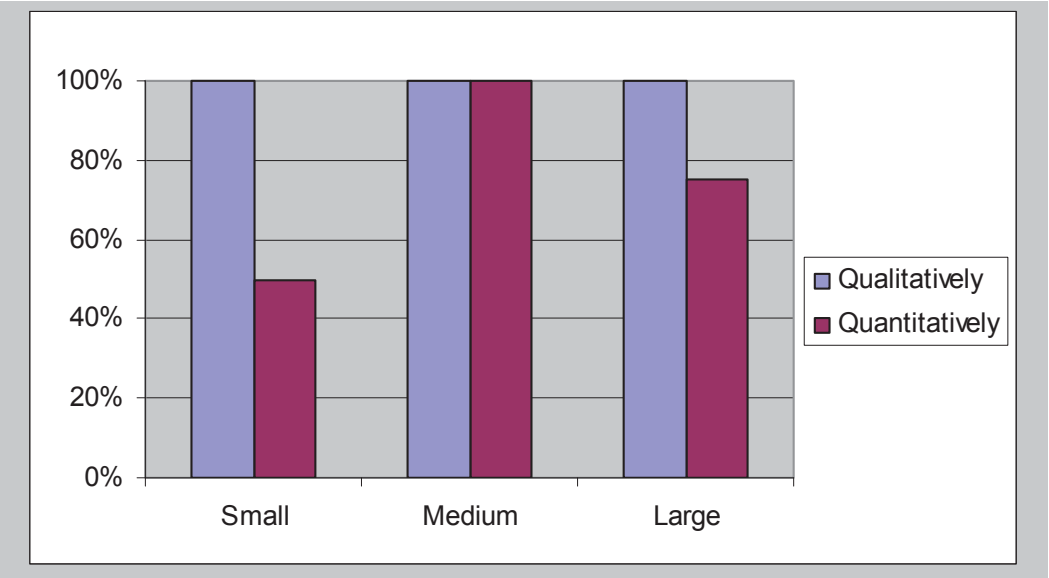

Fig. 38: Audit Processing

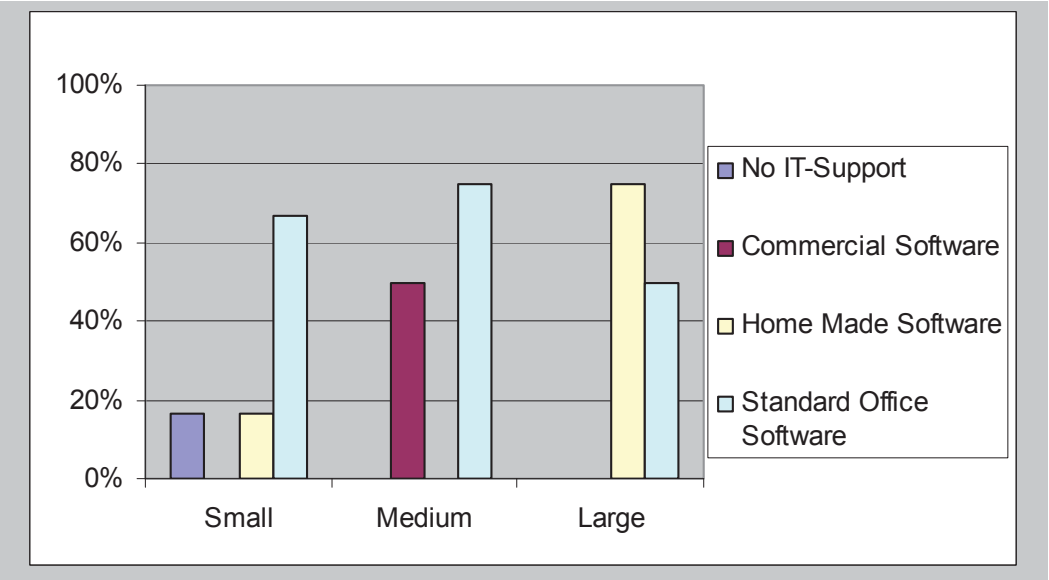

Fig. 39: IT-Usage for Interpretation

Fig. 40 demonstrates that companies of all sizes use audit reports to communicate their audit findings to stakeholders, but larger companies may also use more work-intensive methods.

Looking at the control devices used for the follow up (see Fig. 41), one can see that tracking software is mostly used by small companies while the larger ones concentrate on other devices.

Comparing the communication devices and the follow up control of the small companies, it becomes clear that audit reports go hand in hand with tracking software for the follow up procedures. The company using only presentations for the communication process is still building up its auditing system and therefore has no fixed control procedures yet. For the last company a HSEQ committee meeting every two months is key to communication, and the audit team leader is responsible for controlling the action plan worked out with the auditee.

Most of the middle sized companies use the audit report and a presentation at the final meeting for the communication of the audit findings. The last company uses quarterly reports for communication and controlling aspects. The response here shows no common approach in this group.

One of the large companies relies on final meetings and action plans for the communication of their findings, additionally using the action plan as a control system. Another company sends an audit report to every party involved after the auditee has been informed by a short draft report. The follow-up procedures are controlled by tracking procedures embedded in the auditing framework. The last two companies concentrate their communication of audit findings in reports, which are also used to track the quality of operations over a long time period. For the control of the follow-up procedures, one company uses an automated action tracking system, while the other relies on regular reports to the management.

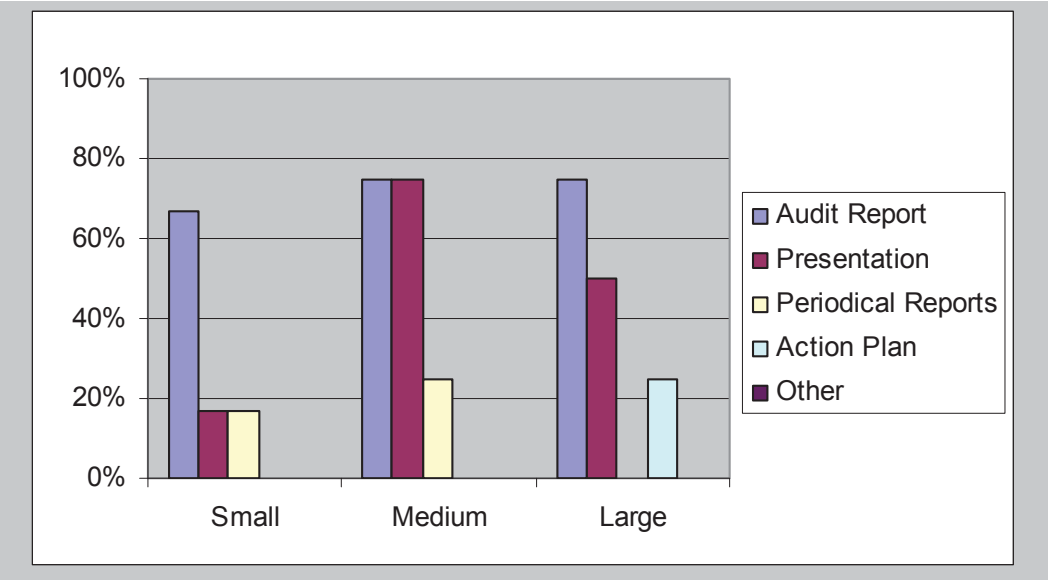

Fig. 40: Communication Devices for Audit Findings

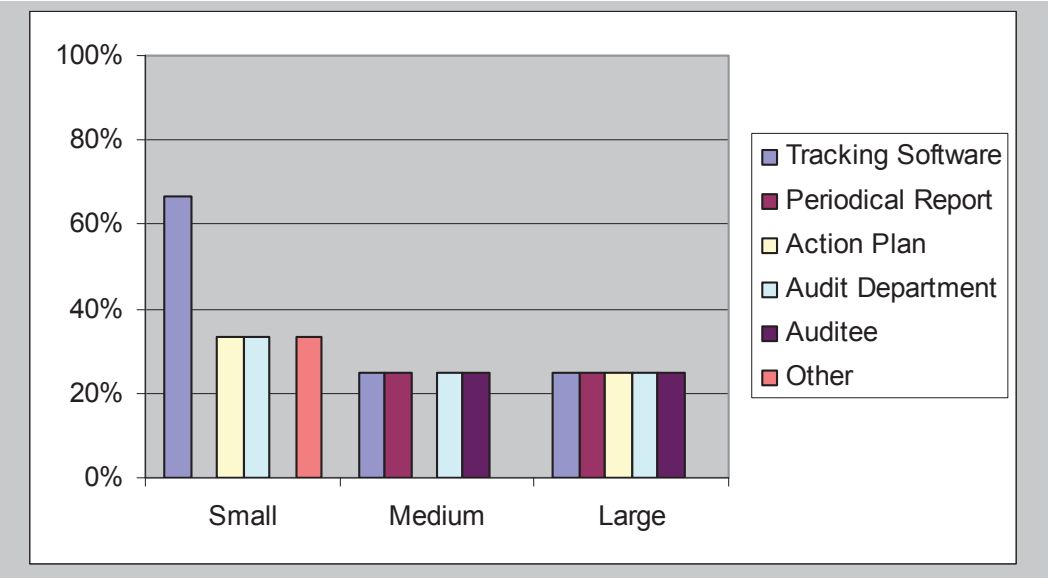

Fig. 41: Control Devices for Follow-Up Procedures

6 Interpretation of OMV Auditing

This part of the thesis will deal with the similarities and differences of the auditing habits between OMV- HSEQ and the results found in the industry survey. In the second part of this chapter. OMV will be compared with the requirements of the ISO standards.

6.1 Comparison of OMV with Survey Results

Of the companies taking part in the survey, OMV is the fourth largest according to the number of employees. Therefore, OMV's results will first be compared with the other 13 participants as a group and then with the three companies in the large group. This should give a good overview of the differences that should be noticed.

The auditing philosophy (see Fig. 42) demonstrates that OMV concentrates its auditing on internal rules and also uses auditing to communicate its best practice within the company, which are the most important (most important or most common?) factors according to the survey. The accordance with external certificates, especially ISO14000, was also cited by several companies as an important auditing target and should therefore be considered by OMV as an additional target. Reputation is less cited, which could be because there are lots of other actions that could be used for public relations. Additionally one large company mentioned sector leadership as a target for auditing, while some smaller companies cited risk management.

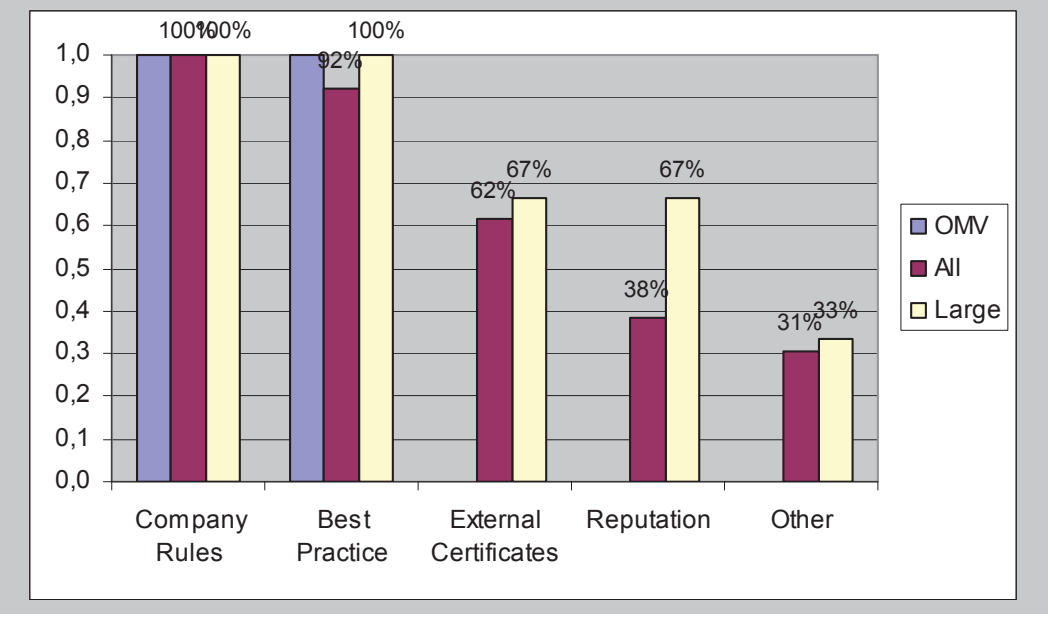

Fig. 42: Comparison of OMV: Auditing Philosophy

Fig. 43 and Fig. 44, which show the auditing reference and the certificates possessed by the companies, indicate that in these areas, OMV lies behind its competitors. All of the large companies use ISO 14000 as reference for their auditing procedures, and they have also passed the certification in this standard. One of the large companies additionally includes the rules from ISO 9000 and OHSAS 18001 in their auditing portfolio, even if that company doesn't possess this certificate. Also, for many of the smaller companies, ISO 14000 is an important reference for their auditing work, therefore OMV should consider including this standard into its auditing procedure and try to gain the certification from an accredited auditor.

Including ISO 9000 or OHSAS rules into the auditing portfolio might be interesting for special targets, but since they are not often used by other companies this could might not bring return on investment.

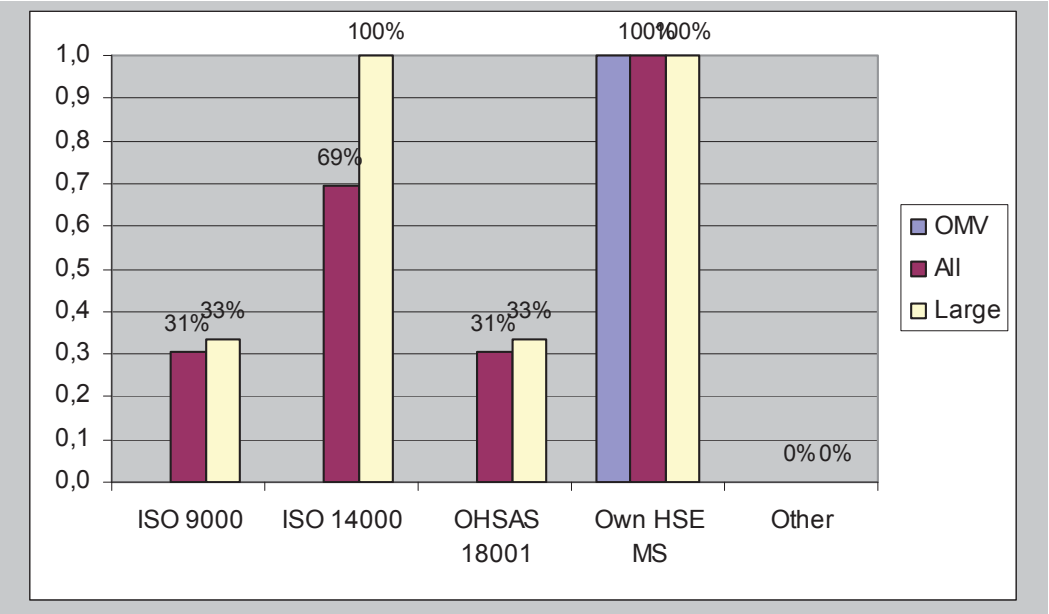

Fig. 43: Comparison of OMV: Auditing Reference

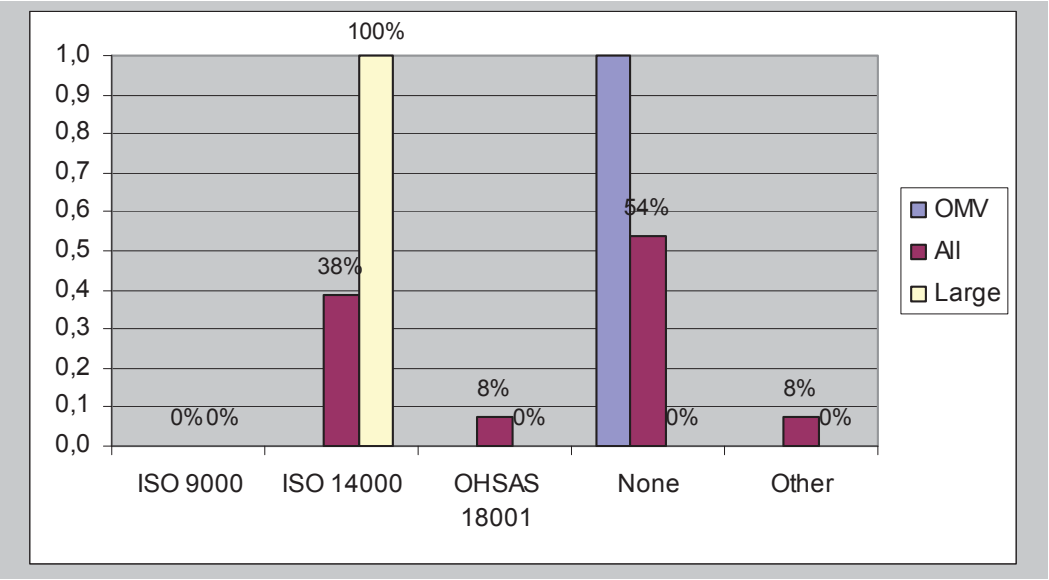

Fig. 44: Comparison of OMV: Certificates

The training of audit team members and audit team leaders is an important aspect for the quality of the auditing efforts. In Fig. 45 and Fig. 46 there are some positions, where the participants could include concrete numbers, and for this positions the number 0.5 was used for OMV, since they didn't include a specific number.

Since audit team members could also be topic experts in some cases, the training for them differs very much across the board. For the audit team members, OMV requires them to have working experience in operative or management work. On the other hand, OMV doesn't require its team members to participate in auditor training courses, which is an important point for some of the other companies. Especially the large companies want their team members to have such training. OMV also didn't state how much experience it wants its team members to have, while those mostly small companies interested in this point normally cited 5 years as a minimum.

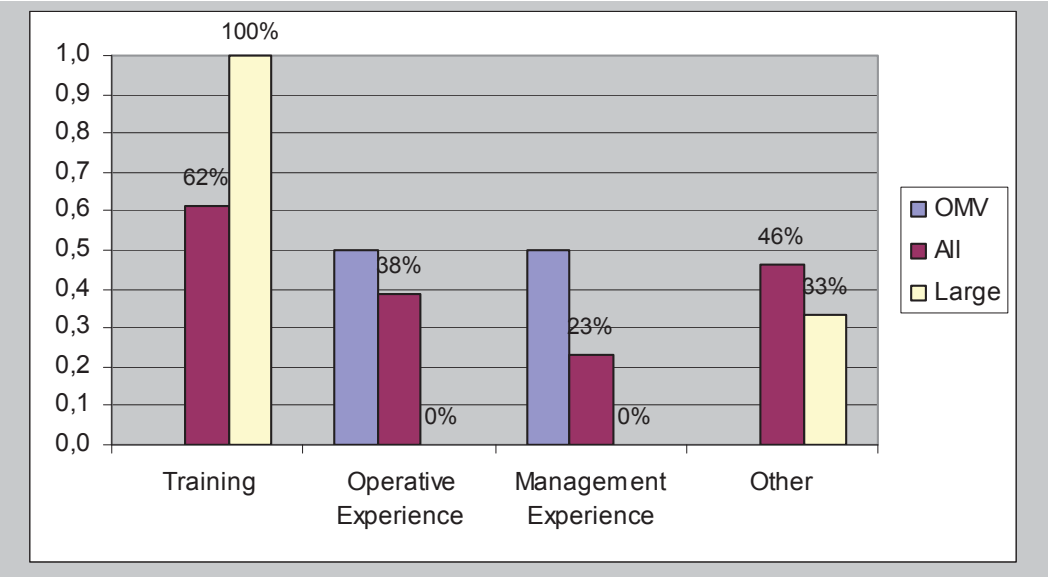

Fig. 45: Comparison of OMV: Auditor Training

The audit team leader training on the other hand is much more intensive, since he or she will have to carry the responsibility for the accuracy of an audit. As can be seen in Fig. 46, OMV requires its team leaders to have some working experience and also to have already taken part in some audits, but without specifying how much or how many. As most of the companies, OMV also believes in team leader training for its audit team leaders. Personal qualifications for this job are also needed at OMV, while other companies prefer to ask for more auditing experience. One point where OMV differs from many other companies is the certificates of upcoming team leaders. For two of the large companies, an audit team leader must have team leader certification, before he or she would be allowed to lead an audit team.

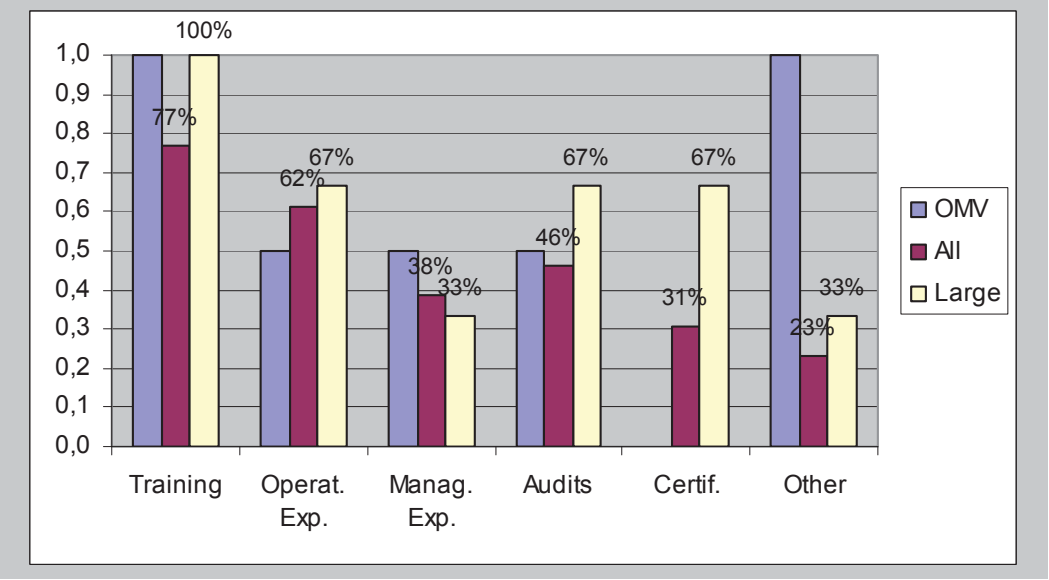

Fig. 46: Comparison of OMV: Audit Team Leader Training

OMV HSEQ concentrates its auditing efforts on 2nd party audits only (see Fig. 47), which might be insufficient in comparison to the competitors. Even though 2nd party audits are the most important in the whole peer group, there are also many competitors who use 1st and 3rd party audits, with many of the companies using at least two different kinds of audits. Especially in the group of large companies, every competitor uses all three kinds of audits.

In terms of the amount of audits done, OMV doesn't do too many audits per year, compared with the other companies (see Fig. 48). At less than 20 audits, OMV still lies within the range that is common for small companies. The large companies on the other hand do many more audits than OMV.

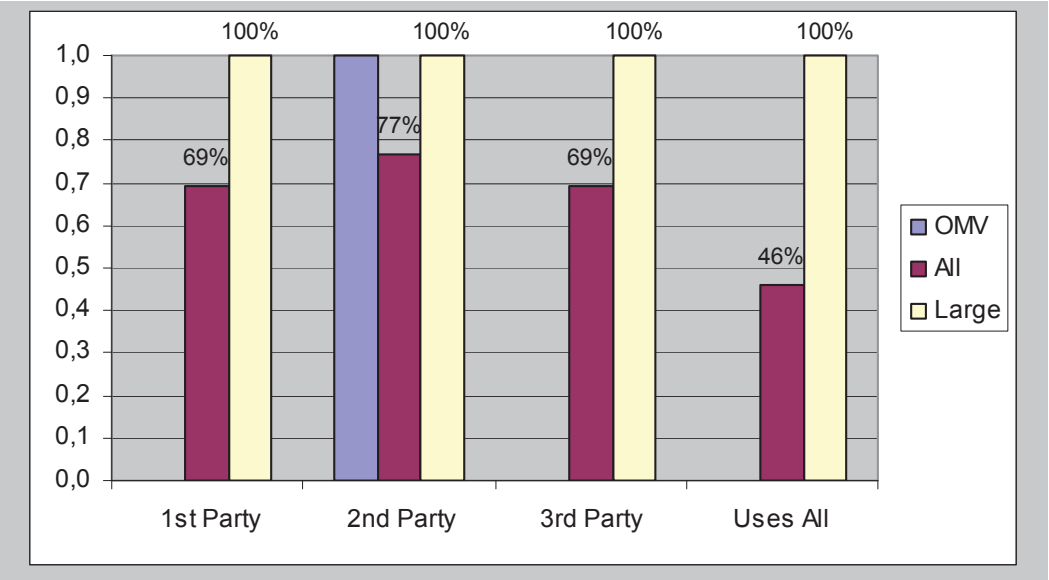

Fig. 47: Comparison of OMV: Audit Types

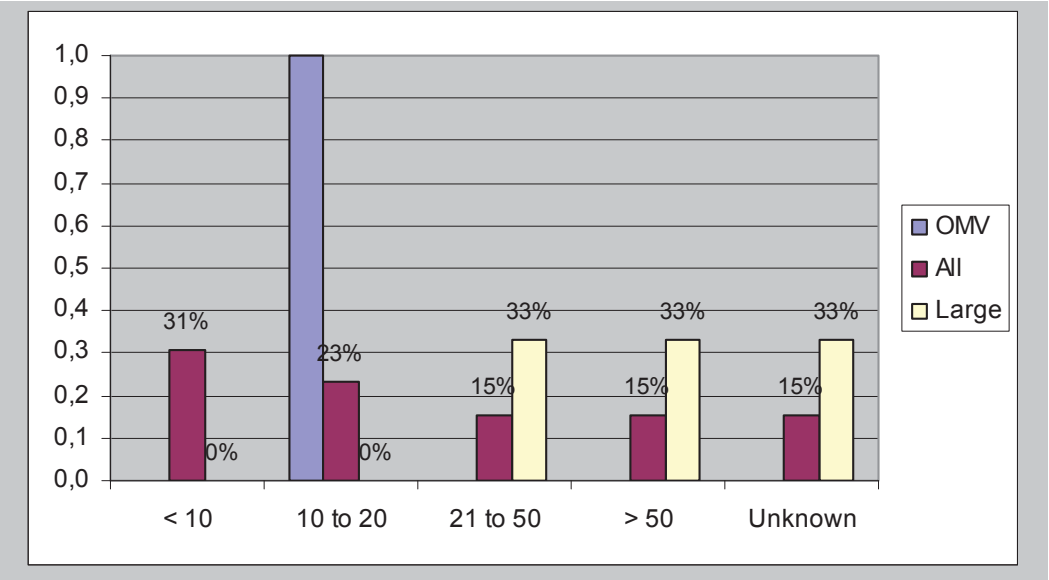

Fig. 48: Comparison of OMV: Number of Audits

As can be seen in Fig. 49, OMV audits almost all the topics given in the survey, so that in this point OMV is even with the other large companies. Only one of the large companies cited some additional auditing topics, namely logistics and waste disposal. Compared with the smaller companies, OMV lies far ahead according to the number of different topics included in the auditing system, since the smaller companies mostly cited three to four different topics.

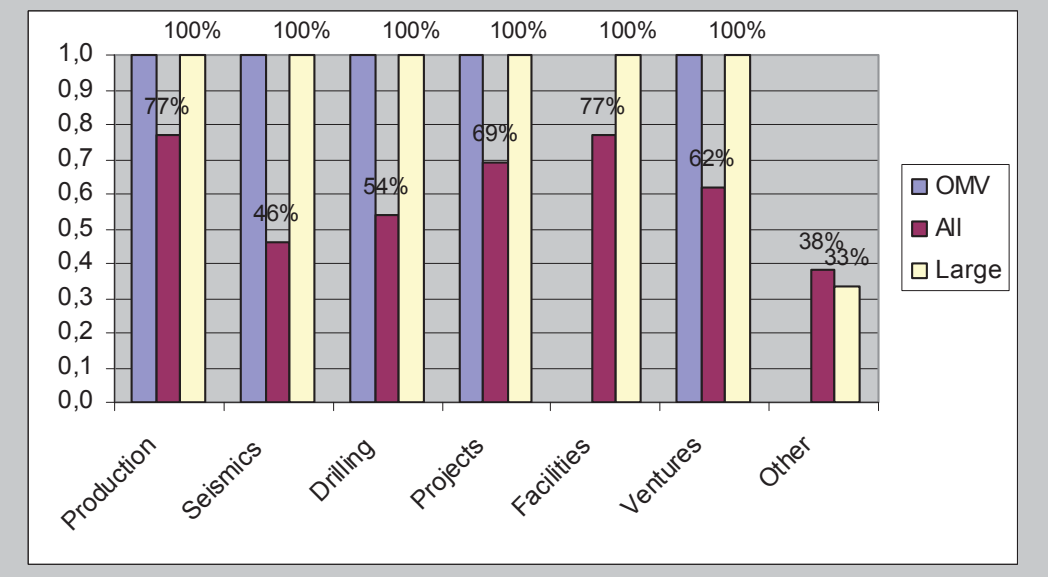

Fig. 49: Comparison of OMV: Auditing Topics

Since the way an audit is done is influenced by the group that has to work with the results, the stakeholders of auditing are very important. When comparing now the stakeholders, OMV primarily informs the line management and its employees. This is especially interesting, since only very few other companies put their employees on the list of important groups for auditing. In contrast, many companies answered that the top management is one of the important stakeholders of their auditing efforts, and there are also several companies that see their own HSEQ department as a stakeholder of the audits which they conduct.

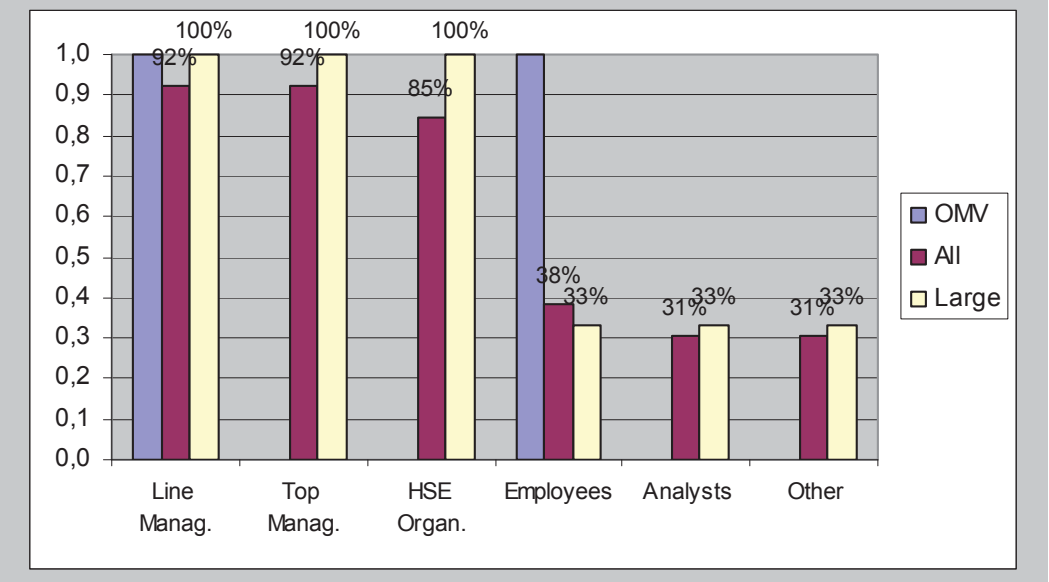

Fig. 50: Comparison of OMV: Auditing Stakeholders

The way OMV communicates its audit findings (see Fig. 51) differs from the way the other companies handle this. OMV strongly relies on the presentation of the audit findings during the close out meeting of an audit. Additionally, the audit findings are transformed into an action plan, which is afterwards used to control the follow-up procedures. Among the other companies, the audit report is the most important tool for the communication of findings. Only few companies use a presentation as additional tool.

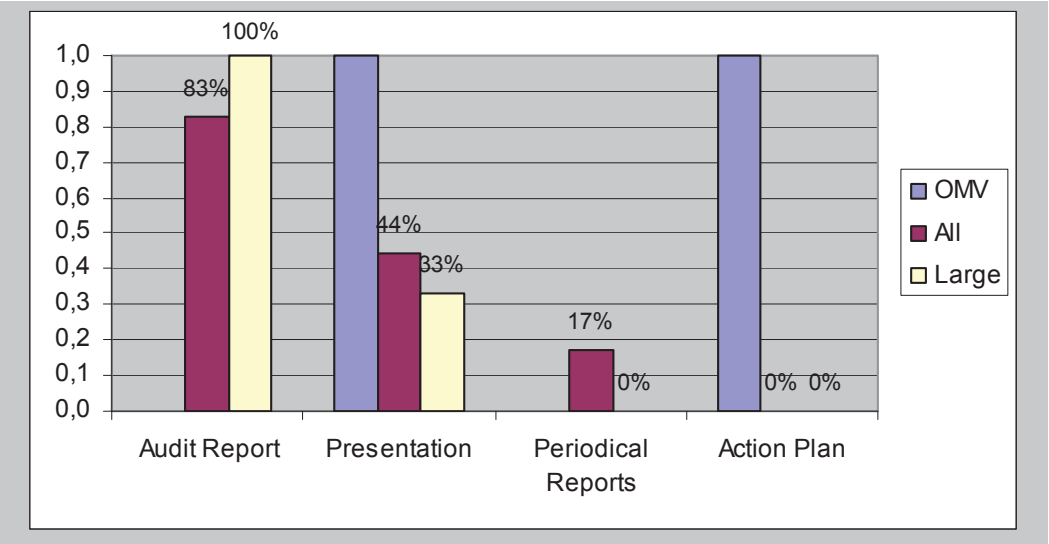

Fig. 51: Comparison of OMV: Communication of Results

The follow up procedures in the industry differ greatly, so that there is no actual best practice to be seen from this survey.

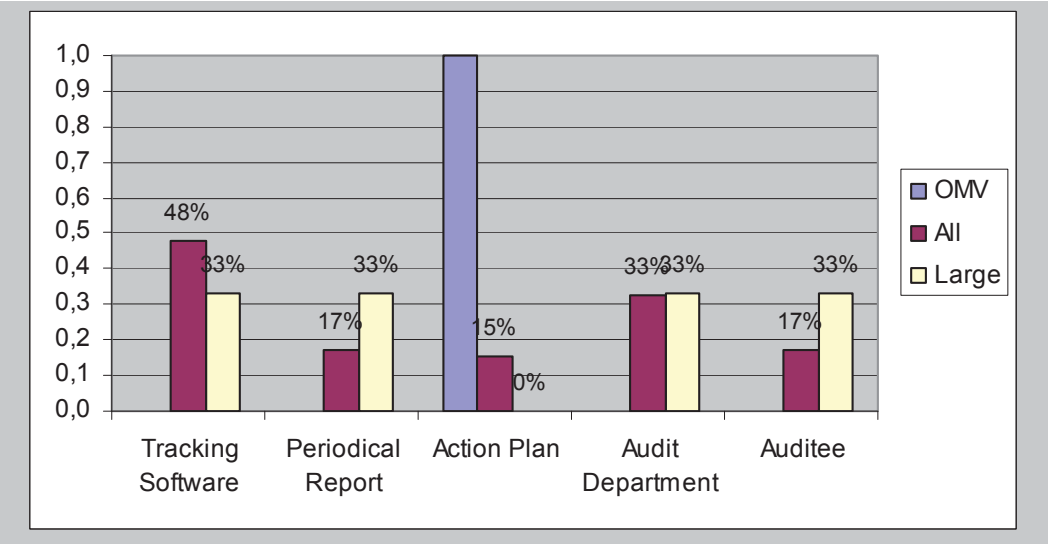

Fig. 52: Comparison of OMV: Follow-Up Procedures

6.2 Comparison of OMV HSEQ Audits with ISO19011 on the Example of a Drill-Site Audit

After comparing the OMV auditing habits with the methods used in other oil and gas producing industries, this chapter will deal with the references stated in the ISO19011 (see also chap.2.5). In this chapter the main recommendation of the international norm will be cited, and then compared with the techniques used by the OMV for their auditing of Tunisia drilling operations in June 2006.

Since I was never part of an audit team most of the comparisons in this section will be cited from the audit report of an external auditor (ModuSpec), who overlooked the Tunisia auditing operation.

6.2.1 Audit Preparation

Auditing is characterized by a number of principles: professional care, ethical conduct, fair presentation, independence and an evidence-based approach. These principles are important to make the audit a reliable and effective tool to support the organization in improvement actions.[94]

If an audit is feasible, the designed audit team leader has to assemble an audit team. The number of people in this team should comply with the complexity and duration of the audit. He has to take care that the team possesses the overall competence to fulfill all the tasks needed to complete the audit, and that the team members are independent of the auditee. If needed an audit team can also contain technical experts which don't have to be trained auditors.[95]

According to the ISO norm, the main objectives of the first contact are:

- Establishing the communications channels
- Providing information about the audit team and the audit timing
- Requesting access to relevant documents and records
- Agreement on observers and needed guides for the audit team

[94] See: ISO19011:2002, chap. 4
[95] See: ISO19011:2002, chap. 6.2

OMV:

The audit team used by OMV was observed to act in a professional and ethical way. The audit findings and audit report gave a fair representation of the audit activities and the auditee's management system (MS). Two of the members in the audit team unfortunately were responsible for the creation of the MS under inspection, which created a conflict with the basic principle of independence. Additionally the audit team contained a trainee on his first audit.[96]

During the audit preparation, the first contact with the auditee was established by mail. This letter contained the Terms of Reference (ToR) which include the audit objectives, scope and criteria. Furthermore the letter contained a list of the audit team and also a list of the documents which should be at hand during the audit.

Recommendations:

In the future the background of audit team members should be looked upon with more care, to prevent closely linked employees from becoming auditors. For training reasons such persons might take part in the audit as observers.[97]

If the audit team contains auditors-in-training or other team members, who have not been in a specific department/location (e.g. drill site) of the audit before, a guided tour with a technical expert for these team members should be arranged to explain the functions and activities of that location.

If auditors-in-training are part of the audit team, the auditee should be informed of this fact.

6.2.2 Preparation of On-Site Activities

Before the audit team can start its on-site work, the relevant documents of the auditee have to be reviewed. This includes documents and records from the management system and old audit reports. Preferable this should occur some time before the on-site audit activities begin, so that the auditors have enough time to gather information about the auditee.[98]

The audit plan should facilitate scheduling and coordination of the audit activities. It also should be sufficient flexible to allow for needed changes that might arise during the audit activities. Included in the audit plan should be:

[96] See: ModuSpec, p. 8
[97] See: ModuSpec, p. 8 et seqq.
[98] See: ISO19011:2002, chap. 6.3

- The location and date of audit activities
- Objective, scope and audit criteria
- The reference documents that have been reviewed
- The roles and responsibilities of the audit team members

The team leader is responsible for the work distribution among the audit team members. He has to take care, that the workload is divided according to the personal qualifications of the auditors. Additional he is also responsible for the correct and sufficient preparation of all team members and that all team members have prepared their audit checklists and sampling plans. These checklists, in fact, should not restrict the auditors to extend their activities if the need arises.[99]

OMV:

As observed by ModuSpec, the audit team members seemed to know the relevant documents of the auditee, and were well prepared for the auditing activities. The audit plan prepared by the audit team leader was well structured and still gave enough flexibility for unforeseen happenings and changes.[100]

For OMV it would be useful to schedule more time for the interviews and document review in the local office, since the senior representatives and senior managers of an organization are very important interviewing partners for an efficient audit. Since the audit teams of OMV are sometimes very large it would be more time efficient, if the whole team would take part in a site visit after the kick off meeting. Additionally it should be reconsidered, if a smaller audit team could be sufficient for the job.[101]

Recommendations:

Two more forms for the work documents would be useful, to increase the efficiency of on-location activities and also reduce the preparation time for following audits. These documents should be the “record of documents reviewed” and “record of people interviewed”.[102]

After the kick-off meeting, a location visit with all team members should take place, to make everybody familiar with the locations. This will also reduce the amount of guides needed.

[99] See: ISO19011:2002, chap. 6.4
[100] See: ModuSpec, p. 11
[101] See: ModuSpec, p. 11
[102] See: ModuSpec, p. 11

The interviews with top and line managers are crucial for the quality of audit findings, so that care should be taken in selecting the interviewing time, to make sure, that these people are available. Double-checking the interview schedule with the auditee might help in this point.

As said before, more care should be taken to assure the independency of auditors.

6.2.3 On-Site Audit Activities

The opening meeting has the task, to confirm the audit plan and interviewing schedule. It is also used to explain the audit activities which will be undertaken, and give the auditee the possibility to ask questions. If the auditee is not used to being audited, the opening-meeting can be used, to reduce the fear of employees and exactly explain, what an audit is, and what it is used for.[103]

During the audit, the audit team leader should have regularly contact with the auditee, to inform them about the actual state of the audit and report problems. If severe problems are found, the team leader has to immediately inform the auditee. Additionally problems found outside of the audit objective should be recorded shortly.[104]

During an audit lots of information has to be collected and verified. This information can be obtained by interviews, from observation of activities, documents and management system reports. Since the amount of data normally is very large, statistical sampling methods should be used to reduce the time needed, which on the other hand will create some uncertainty.[105]

To create audit findings, the audit evidence has to be evaluated against the audit criteria. Audit findings can show conformity or non-conformity with the audit criteria. Both situations have to be recorded, to create the audit conclusions. In the audit conclusions recommendations for improvement might be included, and follow-up procedures should be discussed.[106]

The last part of the on-site activities should be a close-out meeting with the same people being part of the opening meeting. In the close-out meeting, the audit findings and conclusions have to be presented in such a way, that the auditee understands them. If there are any diverging opinions about some findings, they should be discussed during the meeting.[107]

[103] See: ISO19011:2002, chap. 6.5.1
[104] See: ISO19011:2002, chap. 6.5.2
[105] See: ISO19011:2002, chap. 6.5.4
[106] See: ISO19011:2002, chap. 6.5.5 et seq.
[107] See: ISO19011:2002, chap. 6.5.7

OMV:

In Tunisia, the audit team held three separate opening meetings at the different locations of the audit. These meetings were visited by the employees affected. During these meetings, the audit team members and their responsibilities were introduced, and the audit scope, criteria and objectives were explained. Additionally the audit process and the rating system were explained to the auditee's employees.[108]

During audits, a group meeting of the audit team is normally scheduled every day after the interviews. These meetings are used to discuss the audit progress and reassign work if necessary. If situations with severe risk are found, the auditee was informed immediately. Also findings outside the audit scope are discussed during the evening meetings and reported to the auditee if necessary.

The questionnaire used for the interviews is very large, which makes the collection of audit evidence and creation of audit findings a time consuming process. According to ModuSpec, not all audit team members took part in the final meeting which was used to create the audit findings.[109]

Recommendations:

Since OMV is a large company, and audits are held all across the company, the opening meeting should be rather formal including an attendance list and a minute of the meeting.

If the information presented to the auditee is rather large, it could be helpful to print handouts for every participant.

Since many of the employees are not too familiar with auditing, the opening meeting should be used to give the auditee a good introduction in the way how audits are conducted, and even more important, what the principles of auditing are (fairness, evidence-approach, …).

Since the questionnaire is so complex, a pre-audit could help reducing the amount of questions, by eliminating some policy elements which are unnecessary for a specific audit.[110]

The questions in the questionnaire are grouped by "Level of Compliance". Rearranging the question by "Subject" will make answering them easier, since all questions referring to one topic can be asked after each other (level 0 to level 3).[111]

[108] See: ModuSpec, p. 12
[109] See: ModuSpec, p. 13
[110] See: ModuSpec, p. 15
[111] See: ModuSpec, p. 15

Lots of the questions are formulated in a very complicated way, rewriting these questions in a more simple way can increase the understandability of these questions and reduce the amount of time needed for the interviews.

As stated before, including the “documents reviewed” and “People interviewed” lists in the audit records and audit report will increase performance of later audits.

The meeting which is used to create the audit findings and audit conclusion should be attended by all audit team members to avoid the risk of loosing relevant opinions.[112]

If discussions in the close out meeting show diverging opinions between the audit team and the auditee, the close out meeting should be held in a formal way, and minutes and attendance lists should be written.

6.2.4 Audit Report and Follow-Up Procedures

The audit report should provide a complete, accurate, concise and clear record of the audit. It should also contain the following items:[113]

- The audit objectives, scope, audit client and locations
- The audit team leader and team members
- The audit findings
- The audit conclusion

If adequate, the audit report might also include following items:

- Audit plan
- Unresolved diverging opinions about audit findings
- Recommendations for improvements
- Agreed follow-up procedures

The audit report is lawfully property of the audit client, and should be treated confidentially by all receivers.[114]

Normally the audit ends with the distribution of the audit report to all the parties listed by the audit client. Normally the correction of unconformities found in the audit is not part of the audit itself.[115]

Since the findings of an audit may indicate the need to correct or improve certain parts of the organization or activities, the auditee has to take care that these corrective actions are undertaken. To verify the effectiveness of these corrective actions, normally a follow audit is conducted.

[112] See: ModuSpec, p. 13
[113] See: ISO 19011:2002, chap. 6.6.1
[114] See: ISO19011:2002, chap. 6.6.2
[115] See: ISO19011:2002, chap. 6.7

OMV:

The OMV audit report form meets all the targets that must be included but is very restrictive according to additional information. The audit findings for all of the 12 policy elements can be documented very exact, and also recommendations for each of the findings are possible, but there is no room for additional information, which drops out of this scheme.

At OMV, the time interval between following audits is defined by the amount of conformity with the management system rules, so that major problems will be reviewed earlier than policy elements that only need small improvements.

Recommendations:

The audit report form and the audit tool should be restructured in a way, which opens the possibility to report findings and concerns that are not part of the audit itself, and therefore don't fit in any of the policy elements.

Including some room for records of the close out meeting can improve the significance of the audit report, and improve the quality of audit findings and following audits by showing sectors of uncertainty.

7 Conclusion

Finally the findings of this thesis should be summarized, and from there some recommendations for OMV should be produced.

7.1 Summary of Comparison

This chapter will summarize the findings of the comparisons, to give a fast overview of the survey analysis, and to derive the recommendations of this thesis.

The auditing philosophy of OMV differs only a little bit from the philosophy of other companies. Additionally to the internal management system and the communication of best practice within the company, several other companies create their auditing criteria in compliance with external certification criteria. Especially among large companies, the use of audits for reputation gain is common. The compliance of auditing criteria with external certification rules is in most companies based on ISO14000.

Audit team members in many companies receive a formal auditor training, while OMV concentrates more on experience in management or operative work. According audit team leader training the only difference between OMV and other companies is, that OMV also here has no defined amount of experience needed for its employees, and OMV audit team leader don't need to be certified for their qualifications.

OMV concentrates its auditing efforts on 2nd party audits, which is ok if the number of audits per year is not too large. In contrast to OMV every other large company distributes their auditing effort on all three kinds of audits, which might result from the fact, that most of them are doing many more audits than OMV.

Especially in the communication of audit findings and the control of follow-up procedures, OMV methods differ very much from those used by other companies. In other companies, the audit report is the most important tool for the communication of audit findings, while presentations at the close-out meeting rank far behind. For the control of follow-up procedures, there exist no common tools, as almost every company has its own method to do this.

The comparison of the HSEQ auditing methods with the ISO19011 norm for auditing reveals only one big issue, which must be corrected in the future, and that is the independence of auditors. All other findings of this comparison can be used to improve the efficiency of audits, but are not necessarily needed.

Tab. 4: Summary of Comparison between OMV and Industry Survey

Name	Industry	large	all	OMV
Auditing philosophy	compliance with company rules	100%	100%	
	communicate best practice	100%	92%	
	external certification	67%	62%	
	company reputation	67%	38%	
Auditing reference	own management system	100%	100%	
	ISO14000	100%	69%	
	additional integration of ISO9000 and OHSAS18001	33%	31%	
Certificates	ISO 14000	100%	38%	
Auditor training	formal auditor training	100%	62%	
	topic experience	33%	50%	
	operative or management experience (~5-10 years)	0%	60%	
Team leader training	formal audit team leader training	100%	77%	
	operative or management experience (~5-10 years)	100%	100%	
	took part in audits (~10)	67%	46%	
	certified lead auditor	67%	31%	
Number of audits per year	20 to over 100	100%	30%	
Auditing topics	production, seismics, drilling	100%	60%	
	projects, ventures	100%	65%	
	facilities	100%	77%	
Auditing stakeholders	line management	100%	92%	
	Employees	33%	38%	
	top management, HSE organization	100%	88%	
	external organizations	33%	31%	
Communication of auditing results	audit report	100%	83%	
	presentation	33%	44%	
	action plan	0%	0%	
Controlling of follow-up procedures	tracking software	33%	48%	
	periodic report	33%	17%	
	action plan	0%	15%	

Legend: full compliance
partial compliance
no compliance

The auditing questionnaire of OMV HSEQ is a very large and complex document. Therefore auditing takes long time, and the audit team has to consist of many people, which can create problems during the normal work of employees at the location being audited.

The data shown in Tab. 4 gives an overview of the comparison between OMV and the survey results. The table shows the most important aspects of the comparison. To include the importance of each point, the two percentage columns show, how many large companies chose that point, while the second column represents the percentage of companies from the whole survey that chose each point. As can be easily seen, there are several aspects, where OMV methods differ from those of other companies. The most important aspects where OMV methods don't comply with other E&P companies are probably the auditing philosophy and the auditing reference. The amount of work experience demanded for auditors and lead auditors is specified by other companies with five to ten years. For this point OMV stated no specific amount of knowledge, so that a full compliance cannot be granted.

The results from the comparison between OMV and the ISO19011 standard result in a high compliance with the requirements cited (see Tab. 5). The only severe aspect OMV once didn't comply was the independence of their auditors during the Tunisia audit. All other differences between OMV and the requirements of the norm are rather improvement recommendations.

Tab. 5: Summary of Comparison between OMV and ISO19011

Category	ISO 19011	OMV
Auditing principles	professional care	
	ethical conduct	
	independance	
	evidence-based approcach	
	fair presenation	
Audit preparation	number of auditors compy with audit complexity	
	overall competence of auditteam meets audit requirements	
	communication during first contact	
Preparation of on-site activities	auditors shall be informed about the auditee	
	documents and old audits reports reviewed	
	audit plan includes timetable, locations, documents	
	check lists and sampling plans prepared	
On-site audit activities	opening meeting	
	regular contact between audit team and auditee	
	immediate information about smajor risk situations	
	close-out meeting	
Audit report	must have: audit objective, scope and criteria	
	must have: audit findings	
	must have: audit conclusion	
	may have: unresolved diverging opinions about findings	
	may have: recommendations for improvements	
	may have: agreed follow-up procedures	
	may have: findings outside audit scope	

Legend: full compliance
partial compliance
no compliance

7.2 Recommendations

From the comparison of OMV auditing methods, several improvements can be derived. Some of them have already been mentioned before, but will be repeated in this chapter.

Comparing the number of employees in the HSEQ department with the current size of OMV E&P GmbH reveals that conducting approximately one audit per month results in high workload, but if OMV wants to improve the quality and environmental status of all its divisions, there is no doubt that the amount of audits should increase drastically. The complex and very large questionnaire used for auditing is a big barrier for increasing the amount of audits, which can be done.

During the audit preparation, enough time should be scheduled for the document review and the interviews with local managers, because their information has a big impact on the overall HSEQ rating of a division. With the introduction of 1st party audits, the overall compliance with HSEQ regulations can surely be increased without increasing the workload of the HSEQ department over value.

To better comply with other E&P companies, OMV HSEQ should try to get an ISO14000 certification for the divisions investigated. With such a certification, the compliance with environmental regulations can be promised also to external interest groups, which are not satisfied by internal auditing methods.

In some other companies, audit team leader need to have the lead auditor certification. This could be included in OMV lecture table, if the need arises to promise the qualification of lead auditors to external interest groups. If this need is not given, it won't be necessary.

In the Audit report, more room should be provided, to report findings outside of the audit scope. Additionally minutes written during the opening and close-out meeting will probably increase the informative value of audit reports, and provide the possibility to record diverging opinions about audit findings.

The overall results of the survey are only of limited representative value, due to the small amount of on 14 companies taking part in this survey. To get a better result than this survey was able to produce, another survey done by a professional survey institute should be considered. Such a survey has the possibility to collect more in detail information about the auditing processes of other companies. Additionally the peer group should be enlarged, to increase the representative value of the results. As mentioned already in the analysis, for many of the questions no common best practice could be found, because the answers differed too much between different companies.

The survey done in this thesis is able to give a rough overview about the auditing methods used in other companies and some improvement possibilities of the auditing process, but the survey didn't scratch more than the surface of method available to other companies. Also the survey questionnaire was rather created in an empirical way. Therefore and because of the limited amount of time available for the preparation of the survey, the questionnaire was not able to get more detailed information about the auditing methods of other companies.

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Abbreviations

Chap.	chapter
Et seq.	and following page
Et seqq.	and following pages
Cit.	cited
HSEQ	health, safety, environment and quality
BOE	barrels of oil equivalent (6.000 ft^3 gas are 1 BOE)
ToR	terms of reference
Rev.	revision
EMS	environmental management system
OMS	occupational health and security management system

Glossary

Audit

An audit is a systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled.

Audit criteria

The audit criteria are a set of policies, requirements or procedures, which have to be fulfilled.

Audit evidence

The audit evidence contains records, statements of facts or other information, which are valuable and relevant to the audit criteria.

Audit findings

The audit findings are the results of evaluating the collected audit evidence against the audit criteria. Audit findings must be documented in a way that they are verifiable.

Audit conclusion

The audit conclusion is the result of an audit. It is provided by the audit team after consideration of the audit objectives and all audit findings.

Auditee

The organization, department or facility being audited.

Management concept

The management concept describes the immaterial thoughtful basics of a planned management system. (e.g. St. Galler-Management-Konzept)

Management model

The management model is a concrete description of the organization, including the static and dynamic components. This is normally used as a guideline for the development of a real management system out of a concept. (e.g. the norms for quality management systems ISO 9000 or environmental management systems ISO 14000)

Management system

The management system itself contains all existing rules and functions of a company or organization, which have been planned in a concept and described with a model before. (e.g. the realization of a quality management system according to ISO 9001)

Appendix A

Content:

Explanation Sheet

Questionnaire

MINING METALLURGY MATERIALS

WWW.UNILEOBEN.AC.AT

Explanation sheet

This questionnaire is part of an international survey that is intended to compare the HSE auditing practices of different companies in the E&P sector. This survey does not look at the auditing that is used in the financial services, but only at those used in the health, safety and environment (HSE) management systems.
The questions can be answered directly in the file, but if you deactivate the macros it might malfunction. Answering this survey should not take more than 12 minutes.

Please answer all the questions, and send back the file as attachment to the email-address below by **Friday, January 19. 2007.**
If you are interested in getting a copy of the results to this survey, please state this at the beginning of the questionnaire.

The results of my survey will be anonymous and I will destroy all questionnaires after finishing my diploma thesis.

If you have any questions you can reach me under:
thomas.neuhold@stud.unileoben.ac.at
I will be glad to help.

Terms and Definitions

Audit[1]:	systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled.
Audit findings[1]:	results of the evaluation of the collected audit evidence against audit criteria
Audit criteria[1]:	Set of policies, procedures or requirements pertaining to conduct an audit.
Audit evidence[1]:	Records, statements of facts or other information, which are relevant to the audit criteria and verifiable
Auditor[1]:	person with the competence to conduct an audit

HSE	health, safety and environment
NGO	non-governmental organisations

In the questionnaire text written in this style will be an explanation text to help you with understanding and answering the questions.

☐ **Yes,** send me a copy of the report to this address:

1. Please state the name of your company and your department.
   Company:
   Department:

2. *Please answer the next questions to give me an understanding about the reasons for auditing in your department.*

   2.1. What is the philosophy behind the audits of your company? *(multiple ticks)*
   - ☐ Compliance with external certificates
   - ☐ Compliance with company rules
   - ☐ To find and communicate best practice within the company
   - ☐ For external reasons only (e.g. reputation)
   - ☐ Other:
   - ☐ Answer denied

   2.2. Who are the key stakeholders of your audit process? *(multiple ticks)*
   - ☐ Top management *(executive board, supervisory board)*
   - ☐ Line management
   - ☐ HSE organisation
   - ☐ Employees
   - ☐ Clients
   - ☐ Consultants
   - ☐ Analysts *(e.g. financial community, sustainability ratings)*
   - ☐ NGOs
   - ☐ Public opinion, community
   - ☐ Other:
   - ☐ Answer denied

3. *The qualification of your auditors is very important to assure the quality of audits. Therefore please tell me, what the minimum requirements for their appointment are.*

   3.1. Prerequisites for audit team leader: *(multiple ticks)*
   - ☐ Formal audit team leader training
   - ☐ Has years of operative field experience
   - ☐ Has years of management experience
   - ☐ Candidate has either field or management experience but not both
   - ☐ Has taken part in audits
   - ☐ Has these certificates:
   - ☐ Other:

   3.2. Prerequisites for audit team member: *(multiple ticks)*
   - ☐ Formal auditing training
   - ☐ Has years of operative field experience
   - ☐ Has years of management experience
   - ☐ Candidate has either field or management experience but not both
   - ☐ Other:

4. *The following questions refer to all audits, that quote against your internal reference.*

   4.1. What types of audits do you use? *(multiple ticks)*
   - ☐ 1st party *(=internal, own department or business division,…)*
   - ☐ 2nd party *(=cross audits, between departments,…)*
   - ☐ 3rd party *(=external to company)*

4.2. How many audits per year do you conduct?

4.3. What are the topics of your audits? *(multiple ticks)*

- ☐ Production
- ☐ Seismic
- ☐ Drilling
- ☐ Projects
- ☐ Facilities
- ☐ Ventures/Branch offices
- ☐ Other:
- ☐ Answer denied

4.4. Against what reference do you audit? *(multiple ticks)*

- ☐ ISO 9000 series
- ☐ ISO 14000 series
- ☐ EMAS
- ☐ OHSAS 18001
- ☐ Responsible Care
- ☐ Own HSE management system
- ☐ Other:
- ☐ Answer denied

5. What certificates does your department possess? *(multiple ticks)*

- ☐ ISO 9000 series
- ☐ ISO 14000 series
- ☐ EMAS
- ☐ OHSAS 18001
- ☐ None
- ☐ Other:
- ☐ Answer denied

6. What kind of IT-support does your department primary use for auditing? *(only 1 tick)*

- ☐ No IT-support
- ☐ Commercially available auditing software
- ☐ Home made auditing software
- ☐ Standard office software *(Word, Excel,...)*
- ☐ Other:
- ☐ Answer denied

7. How do you analyse your audit findings? *(multiple ticks)*

- ☐ Qualitatively
- ☐ Quantitatively
- ☐ Other:
- ☐ Answer denied

8. *Please tell me, what happens after an audit has been finished.*

8.1. How are audit findings communicated to high level management?

8.2. How is the follow up of audit findings controlled?

9. Please rate the phrases for the audits your department is responsible for? *(1 tick per line)*

• Complexity of audits	simple	☐	☐	☐	☐	☐	complex
• Repetition time interval	short	☐	☐	☐	☐	☐	long
• line managers in audit team	unimportant	☐	☐	☐	☐	☐	important

Thank you for your assistance.

Thomas Neuhold
Thomas.neuhold@stud.unileoben.ac.at