Optimizing an IT internal control process

A RESEARCH ABOUT THE COLLABORATION BETWEEN THE IT INTERNAL CONTROL TEAM AND CONTROL OWNERS/EXECUTORS

BACHELOR THESIS INDUSTRIAL ENIGINEERING AND MANAGEMENT

Jhinkoe Rai, D.A.
BSc. Industrial Engineering & Management
University of Twente
AIR FRANCE KLM |

Optimizing an IT internal control process

A research about the collaboration between the IT internal control team and control owners/executors

Author:

Darshana Alisa Jhinkoe-Rai

S1453157

BSc. Industrial Engineering and Management

University of Twente

Drienerlolaan 5

7522NB, Enschede

Nederland

Supervisors University of Twente:

Dr. J.M.G. Heerkens

D. Ir. S.J.A. Löwik

Dr. Ir. L.L.M. van der Wegen

Behavioural, Management and Social sciences

Supervisor Air France – KLM:

Mr. A. van der Giessen

Preface

In front of you, you find my bachelor thesis 'Optimizing the IT internal control process at KLM'. I wrote this thesis as a graduation assignment for the bachelor Industrial Engineering and Management at the University of Twente. This thesis discusses a research about the collaboration of the IT internal control team and the control owners and executors at KLM.

I enjoyed my research period at Air France - KLM to maximum. I learned about the company, it's business and ofcourse the blue heart spirit.

Specials thanks, for the ability to enjoy this experience as I did, goes out to Aart van der Giessen. With his help I was able to experience KLM in this short period of time. But ofcourse, he also helped making this research possible. Together with the rest van the IT internal control team, I always had someone to ask for consult. So, another special thanks to the IT internal control team.

This research would not be possible without the input of all the control owners and executors. I like to thank them as well for their open and honest input.

Last but not least, I want to thank Hans Heerkens, Sandor Löwik and Leo van der Wegen of the University of Twente for their supervision.

Darshana Jhinkoe-Rai,

Enschede, 2019

Management summary

IT internal control is a way for the IT department or Air France – KLM to protect, above all, their finances. This duty is taken upon the IT internal control team. One of their tasks is to perform ITGC self-tests. While these tests are due at the end of the financial year, the IT internal control team didn't make this deadline for several years in a row. In this research is we optimize the IT internal control process.

This research is conducted as a graduation assignment for the bachelor Industrial Engineering and Management at the University of Twente commissioned by the IT internal control team of Air France – KLM.

In order to optimize the IT internal control process, the following research question was set up: *How can the process of IT internal control be optimized by improving the collaboration between the IT internal control team and the control owners and control executors/IT specialists?*

To answer this question, firstly, an analyzes of the current situation was done. With this information as background information, all the control owners and control executors were asked about what aspects of the IT internal control process they think need improvements and which should remain the way they are. This information was gathered by interviews. All the statements, problems and non-problems, were recorded. Per statement is also recorded who the statement made and on behalf on which department and platform. Thereafter, every problem statement was presented to the IT internal control, for them to decide whether the problem was influenceable and to what extend the problem an impact on the IT internal control process has.

This information, together with how many times a statement was mentioned, resulted in a ranking of the problems, depicting the order in which the IT internal control has to solve the problems to have the highest impact in improving the collaboration with the control owners and executors, and so, improve the IT internal control process.

Besides the ranking, this research also consists of a result tool, in which all the results are generatable. This tool can show the overall results but more interestingly, it can also show the results depending on the role, department platform and/or control, or any combination of these entities.

Finally, by conducting a literature review, there are solutions given for the top three problem statements with the highest priority.

The top three problem statements are:

- Controls should be more automated on the IT platforms

- There should be access to general information and documents concerning internal control. E.g. a platform or dashboard
- The IT internal control framework should be clear and unambiguous. It should not be possible to interpret things differently

The conclusion and recommendations for the IT internal control team that follow from the results are:

- Perform the ITGC self-tests with a platform specific approach, using the result tool
- Improve the Microsoft SharePoint page
- Elaborate the role of consults by actually using the automated controls in the IT internal control processes
- Plan regular meetings with the control executors and quantify the IT internal control framework

As final part, we discuss this research in a critical way. Discussion points are the current situation in which development and operations teams function separately, the research approach that during the research changed, using more open-ended questions and the consequences of the group interviews.

Inhoud

1. Introduction

This chapter is an introduction to the Air France – KLM company and the research conducted. It commences with facts and figures of the company, followed by information about the aim and tasks of IT internal control, where this research was performed. The chapter continues with the research, discussing the motivation and objective, the selection of the core problem, the research questions, and the chapter concludes with restrictions.

1.1 The company and the IT internal control department

Air France – KLM

Air France – KLM is the mother company of the two airlines Air France and KLM (KLM Royal Dutch Airlines). The two airlines merged in 2004, creating one group with two airlines (KLM, 2015). With this merger the two airlines combined their strengths to retain customers and gain potential customers. The group has 552 airplanes, transporting 93.4 million people in 2016 with a network of 328 destinations in 118 different countries (Air France - KLM, 2017). The group achieved in 2016 a net profit of 792 million Euros. Apart from the regular businesses Air France – KLM makes extraordinary things happen like transporting pandas from China to the Netherlands, and having the king of The Netherlands as a pilot when flying with KLM Cityhopper (KLM, 2017).

IT internal control

The Air France – KLM (AFKL) Group has many business divisions which all contribute to the mission of the group. One of these divisions is Information Services which is managed by the AFKL Group IT and both IT Airlines. Information Services operates for the AFKL Group, focusing on the development, production, deployment and maintenance of IT systems and services that keep all the business divisions running. IT systems like these are for instance the application for booking plane tickets or the application for checking in passengers on a flight. An example of IT services is facilitating and maintaining workstations in the form of laptops, tablets and/or smartphones that enable the employees of Air France – KLM to perform their daily tasks. The AFKL IT Group manages among others the availability, security, maintenance and applications of these workstations (Air France - KLM Information Technology Group, n.d.)

Nowadays the majority of the company's activities is either supported or fully controlled by IT processes. According to International Standards Organisation, ISO, the definition of risk is "the combination of the probability of an event to happen and its consequence". (ISO/TMBG, 2009). As the use of IT extends, the risks that coexist grow as well. The servers at the datacenters are

constantly attacked by cyberattacks, soft protection techniques (e.g. Firewalls) prevent these attacks from causing damage. However, more aggressive cyberattacks cannot be prevented by these soft protection techniques, which makes it significant for the company to protect the data on these servers. Besides data, also applications that involve major cash flows are at risk.

One of the many things Air France – KLM does to protect their financials is internal control. Air France – KLM defines internal control (IC) as:

"Internal Control is defined as a process, effectuated by an entity's board of directors, management and other appropriate personnel, designed to provide reasonable assurance regarding the achievement of objectives relating to operations, reporting and compliance."

Throughout the year, the IT IC team has several tasks that provides them with insight information about the operations, reporting and compliancy of different IT platforms and IT processes (further explained in section 2.4 IT Platforms / IT Processes). Among these tasks is auditing. This auditing process consists of performing different IT general control tests (ITGC self-tests) for IT platforms and IT processes in scope of financial reporting. If an issue occurs, the IT IC team reports to the IT line management who are responsible for a specific control and they will have to remedy this issue. The status of the open issues and the progress of the ITGC self-testing process are communicated to the board of directors of Air France – KLM at the end of every financial year.

1.2 This research

Motivation

Due to various issues and problems within the IT IC team (see Figure 1 Problem cluster), the workload of the team is high. This was particular noticeable when at the end of the financial year 2016 a lot of testing was still to be done. Also, there are a lot of aspects of the process that can, and should be, optimized according to the IT IC team. For this reason, this research was initiated with the following motive:

Motive

To lower the workload of the IT internal control team by optimizing the IT internal control process.

Problem identification

In order to identify the core problem in the IT IC process all the issues and problems are clustered in a problem cluster as seen in Figure 1.

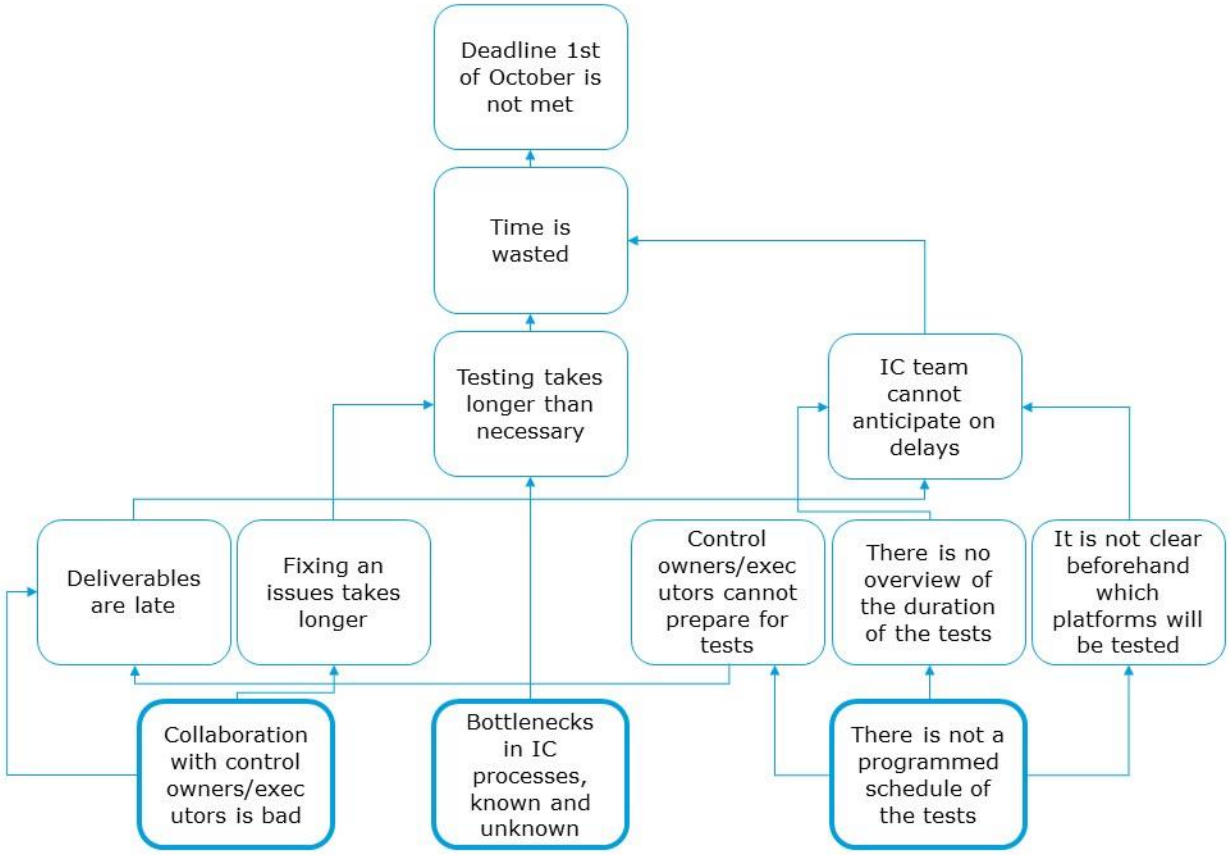


Figure 1 Problem cluster

Concluding from this problem cluster, there are three main problems that cause the other occurring problems. These three problems are the collaboration with control owners and control executors, the bottlenecks in the IT IC process and the lack of a programmed schedule of the tests. According to the ABP guidelines (Algemene Bedrijfskundige Probleemaanpak) all three main problems are a potential core problem (Heerkens & van Winden, 2012).

The decision of selecting a core problem was made in close consultation with the IT IC team.

Collaboration with control owners/executors is bad

Collaboration between the IT IC team and the control owners and control executors had never thoroughly been studied. It is assumed that some of the control owners and control executors do not prioritize the IT IC process over their regular work activities. Because they do not prioritize the IT IC process, delays occur in this process.

Bottlenecks in internal control processes, known and unknown

Many of the bottlenecks within the IT IC team and their way of working are logical consequences of some of the team members being new to the job. Also, every IT IC team member has their own working approach, which causes small differences in the ITGC self-testing process depending on which team member is performing the tests.

There is not a programmed schedule of the tests

At the moment, there are many facts unknown, for instance the time it takes to perform an IT IC test. Also, due to the different actions taken by the IT IC team to improve the IT IC process sudden changes, currently unknown, could occur within the process. This will make a programmed schedule for the IT IC tests unreliable. When the process is optimized, and the other two problems are addressed, it would be more effective to have a programmed schedule.

Because nobody has ever investigated the collaboration between the IT IC team and the control owners and control executors, this core problem was therefore the most valuable one to investigate. The other two problems are less valuable to investigate because the IT IC team is currently trying to investigate the bottlenecks in the process. They have team meetings discussing the (potential) bottlenecks and share best practices. Also, a programmed schedule would be most effective when the collaboration and the bottlenecks are investigated and improved/solved.

The following research question is formulated based on this core problem:

Research question

How can the process of IT internal control be optimized by improving the collaboration between the IT internal control team and the control owners and control executors/IT specialists?

Research questions

During own observations it was clear that improvements can be made in the contact between the IT IC team and the control owners and control executors/IT specialists as well as in the IT IC process.

To answer the main research question, the following follow up research questions are formulated. The questions are based on improvements in contact and process and on filling in the gap in knowledge about the control owners and control executors/IT specialist's experiences with the IT IC process.

1. What is the current situation of the IT internal control process?
2. What is the desired situation of the IT internal control process?

    i. How do the control owners and control executors/IT specialists experience the contact?
    ii. How do the control owners and control executors/IT specialists experience the IT IC process?
3. How can the contact between the IT IC team and the control owners and control executors/IT specialists be improved?
    i. What should be improved on the contact according to the control owners and control executors/IT specialists?
    ii. What aspects of the contact should not be changed according to the control owners and control executors/IT specialists?
4. How can the IT IC process be optimized?
    i. What should be improved on the IT IC process according to the control owners and control executors/IT specialists?
    ii. What aspects of the IT IC process should not be changed according to the control owners and control executors/IT specialists?
5. How should the IT IC team improve the aspects of the contact and the process that should be improved according to the control owners and executors/IT specialists?

The different research questions are discussed in the following chapters. Table 1 gives an overview of which question is answered in which section.

Table 1 Research questions

Question	SECTION Paragraph
Research question	5.1 Answering the research questions
1	2. Current situation
2	4.3 Problem statements versus non-problem statements
3	4.4 Prioritization of the problem statements 4.5 Statements per department, platform and role
4	4.4 Prioritization of the problem statements 4.5 Statements per department, platform and role
5	4.7 Solutions to the top problem statements

Restrictions

The focus will be on the collaboration between the IT IC team and the control owners and control executors concerning testing on controls. All other aspects of the IT internal control process and tasks of the IT internal control team are not part of this research.

Due to differences in French and Dutch laws there is a difference between the IT IC team on the Air France side and on the KLM side. Because the research is conducted in Amsterdam on the KLM side and because the IT IC team involved in this research is only testing platforms and processes that concern KLM businesses the final results of this research and the recommendations only refers to the KLM IT IC processes.

2. Current situation

This chapter gives answer to research question 1; what is the current situation of the IT IC process? By site visits of the IT IC team the different aspects of the IT IC process had been determined. These aspects are: departments, IT IC team, IT platforms/processes, control owners and control executors/IT specialists, controls, and the testing process. The current situation is based on an analysis of these aspects. We focus on the facts, rules and regulations that concern the workload of the IT IC team and/or the collaboration with the control owners and executors/IT specialists.

2.1 Departments

The IT department of Air France – KLM is divided into four departments: Development (Dev), Operations (Ops), Distributed Services (DS) and the CIO Office (chief information officer office = CIOO). The IT IC team is functionally part of the CIOO, but the individual IT IC team members are hierarchically positioned in the respective departments Dev, Ops and DS.

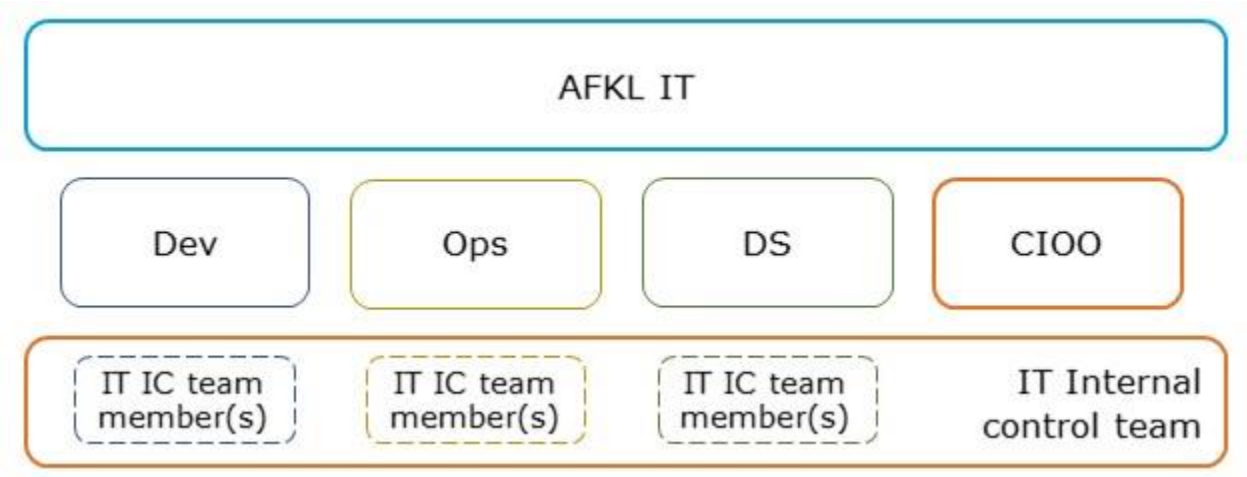


Figure 2 Departmental organization structure

- Dev is the application development division that aims to implement tomorrow's IT applications. It consists of departments dedicated to business domains and projects that create these applications, soft- and hardware.
- Ops consists of IT platforms and activities that concern the IT continuity of the applications, soft- and hardware that is used to make the business of Air France – KLM possible, for example the booking system.
- The DS department facilitates all IT necessary for all the Air France – KLM employees, e.g. laptops, tablets and telephony but also the mail servers and conference call applications.

The IT department increasingly uses Agile practices to speed up delivery of their new/adapted IT services, e.g. by blending Dev and Ops staff in one team. KLM defines agile teams as:

"An Agile Team is a cross-functional, multi-disciplinary and fulltime dedicated group of 5 to 11 people including a Product Owner and a Facilitator (e.g. Scrum Master) who have shared responsibility to define, build, test, deploy and maintain a Product or Service, or part of it, in a short Iteration time box (Scrum) and/or on a continuous basis (Kanban)." (Air France - KLM Information Technology Group, sd)

The vision for the future is to work with such multidisciplinary teams, in order to have all the relevant knowledge of a specific application or system within such a team. However, this research is solely based on the situation in which Dev and Ops teams operate separately.

2.2 IT internal control team

Currently, the IT IC team consists of five employees. These employees are responsible for testing the ITGCs of different IT platforms and processes. Last year the leaving of two employees resulted in a renewed composition of the team. According to KLM Human Resource policy vacancies were opened for internal applicants firstly. For the new employees in the IT IC team, training on the job is used as the main training method. Doeringer and Piore said recruiting from an internal labor market obtains efficiency in recruiting and screening because the skills and behavioral characteristics of the employee are already known. However potential new hires from an external labor market maybe more qualified for the position such that less training would be necessary. This would reduce the efficiency obtained from recruitment and screening as more training is necessary. How much the efficiency reduces when training on the job is used as main training method is heavily dependent on the natural curiosity, the desire to show off and the reinforcement value of imitation. (Doeringer & Piore, 1970). This would imply for the IT IC team that the efficiency of the IT IC process could be reduced by recruiting internal applicants and training them on the job.

2.3 Control owners and control executors/IT specialists

For every control on every platform or process there is a control owner and control executor responsible. The control owner is a N-3 level manager, manager of one or more platforms, while the control executor is a N-4 level manager, the manager of a specific platform. The control owner owns the issue, if any exists, and is the accountable person. The control executor on the other hand is responsible for the issue existing and solving the problem that causes the existence of the issue. The internal control team collaborates

with the control owner when it comes to the status of a platform and its issues. The collaboration with the control executor is more extensive. This collaboration also includes the IT IC testing process. However, in practice, it appears that this collaboration is delegated by the control executors to one or more IT specialists working on a specific platform. For the rest of this reports, control executor means both the control executor and IT specialists fulfilling the role of control executor.

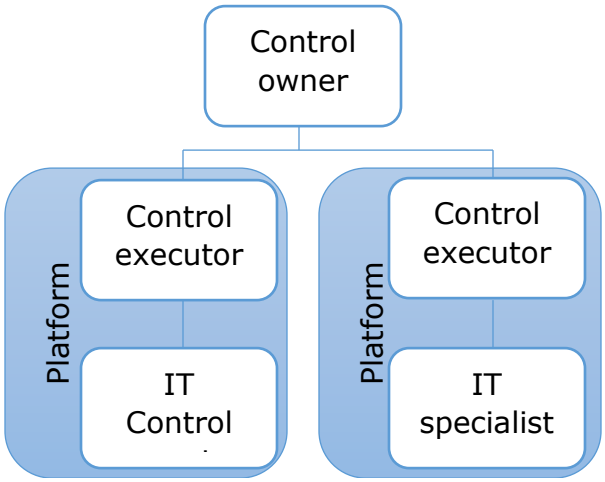


Figure 3 Organogram stakeholders

2.4 IT Platforms / IT Processes

There are currently 12 different IT technical platforms involved in the IT IC testing process. These platforms are either an individual platform or a group of platforms. These 12 platforms are:

- DB2/IMS
- Exchange
- Firewalls
- Linux
- Oracle non-SAP
- Oracle SAP
- SAP TAM
- SAP / JIRA / SM9
- SQL server
- Workstations
- Windows
- z/OS

Apart from these twelve platforms there are also four processes and/or projects that require IT IC self-testing. These processes and/or projects are generically applicable to IT staff e.g. the Change Management and the Incident

management process. In this research 'platforms' refer to both the twelve platforms and the four processes.

2.5 Controls

The 'rules' that apply to an IT platform to ensure that the data and financials of this platform are protected are called controls. Such a control for instance is: A password to an employee's account to make any changes to an application must be at least 9 characters. Every control is defined and specified in the IT IC framework, a document within the Air France – KLM IT department. There are 20 different controls, named: C1, C2, C3, …, C20. Besides a description of the control, this framework holds also other significant information. Among others, the platforms to which the control applies, the control owner and control executor, the risk factor and the evidence that a platform or process should bring to prove that they are indeed in control. This IT IC framework and all the other relevant information about IT IC is available on the internal Microsoft SharePoint page for the IT IC team, but also for the control owners and control executors.

Separate IC frameworks for Air France and KLM were developed in compliance with the Sarbanes-Oxley legislation (SOx) as obligated for being listed on the New York Stock Exchange. February 2008 Air France – KLM delisted from the New York Stock Exchange, however the Group Executive committee decided to keep the controls in force. In 2011 the separated frameworks got combined to a common Air France – KLM IT general control framework, as used today. This document is annually updated as a means to risk, compliance and quality management and IC. Relevant changes within ICT processes will also cause corresponding changes to the IT IC framework during this annual update. These changes can however not affect the compliance with the SOx legislation. The SOx legislation may cause that a desired improvement of the control owners and control executors/IT specialists will not be possible to implement in reality.

2.6 Testing process

In the current situation the IT general control self-testing process depends on the IT IC team-member that is performing the self-tests. Every IC team member has their own approach. This results in small differences in IT IC process depending on which IT IC member performs the tests. In general, the process consists of consulting with the platform about changes made in the team or platform's processes. If the changes are significant for the controls the IT IC team-member must change the ITGC control details and their approach of ITGC self-testing. After discussing the changes, the IT IC team member communicates to the control executor/IT specialist what evidence

they want to receive. The control executor/IT specialist deliver the evidence and based on this evidence the IT IC team member performs the test and provides the results. The differences in the process, depending on the IC member, are for instance how they approach the control executor/IT specialist, by mail or by phone, but also the deadline for delivering evidence can differ depending on the schedule of the IC team member. The risks and benefits of the differences in approach are shared with the IT IC team in staff meetings.

Currently, the IT IC team tries to improve the ITGC self-testing process in different ways. One of these ways is this research about the collaboration with the control owner and control executors/IT specialists. Other ways are sharing their different approaches of the ITGC self-testing process with the other IT IC team members. Another way in which they try to improve the process is by working on an awareness module to highlight the topic of IC within the IT department of Air France – KLM. This module is an online click-program that is supposed to be easy to understand and simple to use. It consists of every important aspect of the IT IC process that the users (mainly the control owners and control executors/IT specialists, but also other parties of interest) should be aware of.

Knowing the current situation by facts rules and regulations of the IT departments, IT IC team, IT platforms, control owners and control executors, controls and the testing process will help to put the results of the remaining of this research in perspective. It serves as background information when talking to the control owners and executors about the collaboration and the IT IC process.

3. Research approach

This chapter describes the approach used to answer the research questions, beginning with why interviewing was selected as research method, what type of interviewing method was selected and how the interviews were set up. In addition to this, this chapter explains the statements derived from the data, categorizes these statements and motivates recording the statements. The second part describes the method of prioritizing the statements. In the final part, the method of finding a solution to the problem statements with highest priority is described.

3.1 Research method

To answer the research question *How can the process of IT internal control be optimized by improving the collaboration between the IT internal control team and the control owners and control executors/IT specialists?* The first thing to find out is what aspects of the collaboration needs improvements. Through a survey research control owners and control executors and IT specialists get the chance to express the aspects of the IT IC process that need improvement according to their experiences and opinions. With this survey they also get the chance to complement aspects of the IT IC process that are going well and/or are experienced as pleasant.

By interviewing all the control owners and control executors/IT specialists a data collection is generated of all the aspects of the IT IC process that need improvements and/or should remain the same according to the interviewees. Every problem or non-problem mentioned is considered a statement. The statements are a perspective of the control owners and control executors/IT specialists on the IT IC process, this gives the IT IC team the opportunity to change the process with the aim to improve the collaboration.

Semi-structured face-to-face interviews

There has been chosen for semi-structured face-to-face interviews as survey research method. With the use of face-to-face interviewing the interviewer can clarify the questions as well as ask for clarification of the answers of the control owners and control executors/IT specialists. It makes it also possible to ask focused follow-up questions based on the answers of the control owners and control executors/IT specialists. Because the topics of the interview are predetermined the face-to-face interviews are structured. This, together with giving the control owners and control executors/IT specialists the chance to come up with different aspects of the IT IC process that need improvements, makes the survey research method a semi-structured face-to-face interview. (Lavrakas, 2008)

Set-up of the interviews

All the control owners and control executors are invited for an interview by a meeting invitation. In this invitation the aim of the research is briefly explained, and a proposal of the meeting time and date is introduced.

According to the IT IC framework IT specialists do not have a role in the IT IC process. However, as mentioned before, in practice, IT specialists working on large processes that need to be tested, will be in contact with the IT IC team about the IT IC process. This happens both in addition to and instead of the control executor on the process. Because of the time it takes to interview all the control executors and IT specialists individually, both are invited for the same meeting.

In 2011 Ivana Acocella did research to analyze the advantages and disadvantages of groups in research. From this research there had been concluded that during a focus group discussion various cognitive and communicative mechanisms can emerge. These mechanisms have advantageous as well as disadvantageous. The disadvantageous mechanisms that can emerge are

- Speed of interaction and several coordination problems can cause slowing down the free production of idea
- The presence of other people can cause a participant to give more socially desirable and stereotypical answers

These risks should be taken into consideration to understand the reliability and quality of the results from the research. (Acocella, 2011)

Because the control executor and IT specialists are invited for the same interview, 22 interviews are taken. Eight interviews are with control owners (A till H) and sixteen interviews with control executors and the corresponding IT specialists. An overview of this, and the number of IT specialist per platform can be seen in Table 2.

Table 2 interviewed control owners and control executors/IT specialists

Control owner	Platform	#control executor	#IT specialists
A	DB2/IMS	1	1
	z/OS	1	1
B	Exchange	1	1
C	Firewalls	1	1
	Linux	1	4
	Oracle SAP	1	1

	SAP TAM	1	1
	Windows	1	2
	Process	1	0
	Process	1	1
D	Oracle non-SAP	1	3
	SQL	1	1
E	SAP/JIRA/SM9	1	1
F	Workstations	1	1
G	Process	1	0
H	Process	1	0

Interview structure

The interviews were set up by an introduction followed up by five open questions and the closing part. The introduction consisted of explaining the background of the researcher and the goal of the research. According to Lavrakas (2008) the introduction of the interview needs proper preparation. The introduction is meant to give the control owners and control executors/IT specialists a comfortable feeling. This way they are willing to give personal, honest and open answers to the questions asked.

The five open questions of the survey are based on the follow up research questions and are as followed:

- How often do you get in contact with the IT IC team?
- What types of getting in contact are used when getting in contact with the IT IC team (i.e. mail, phone, virtual meetings etc.)?
- How do you experience this contact?
- What is going well?
- What can be improved?

All these questions are about the IT IC process and the IT general controls the control owners and control executors/IT specialists are responsible for as also mentioned in the introduction of the interview.

The first two questions will give measurable responses that are comparable. The third question will answer research question 2, the fourth will answer research question 3i and 4i, and the last question will answer question 3ii and 4ii.

The closing of the interview consists of explaining that all the topics mentioned in the interview will be passed on to the IT IC team but cannot all be part of the research solution. The interview is concluded by thanking the interviewees

for the time taken for this interview and the openness of the answers during the interview.

The last two questions are purposely very broad. It is up to the control owners and control executors/IT specialists to think as broad as possible about aspects that should or shouldn't be improved. This can be about every aspect they consider part of the IT IC process. As the interviewer knows which aspects are discussed in earlier interviews, these aspects are mentioned when the control owners and control executors/IT specialists didn't refer to them by themselves by the end of the interview.

After the interview the data received during the interview will be stored as minutes.

Change in interview structure

After a few interviews it turned out that the kind of contact the control owners and control executors have with the IT IC team, and the frequency of these contacts differ in every single situation. Depending on the personnel preferences of the control owners and control executors/IT specialists this is considered more or less and/or pleasant or unpleasant. Also, the platform and control has influence on the frequency and kind of contact and how it is experienced. During the interviews the approach changed to a more unstructured face-to-face interview method. Instead of the first two questions the introduction of the interview was a little extended by explaining that there is a lack of knowledge from the perspective of the control owners and control executors/IT specialists on the aspects of the IT IC process that need improvements, contact being one of these aspects. This way the third question was incorporated into the last two questions.

A consequence of this change is that there is no clear bifurcation in contact and process in the questions and thus in the results. Which means there cannot be a clear bifurcation in contact and process when answering the research questions in 5.1 Answering the research questions.

3.2 Problem and non-problem statements

During the interviews the control owners and control executors had the opportunity to express their experience with regards to the IT IC process. They pointed out the aspects of the IT IC process that need and improvements and the aspects that should remain, according to them. This data is derived to statements. The problem statements being the statements that are about aspects of the IT IC process that should improve. Non-problem statements on the other hand, are statements about aspects of the IT IC process that, according to the control owners and control executors, are going well and are

preferred to not undergo any changes. The control owners and control executors/IT specialists had the opportunity, after the interviews, to give feedback on the statements that were derived. According to the feedback the statements were finalized. An overview of all the final 61 problem and non-problem statements that are derived from the data received through the interviews can be found in Appendix A.

Categories

For every statement made, the subject of the statement is established in order to clarify the aspects of the IT IC process that should or should not be improved. These subjects are translated to seven different categories, among which all the problem and non-problem statements are divided. An overview of the categorized statements can be found in Appendix A. The categories are:

Role

Statements with the subject role name, role description or the person assigned to the role.

Awareness

Statements with the subject awareness of the content of the IT IC process and the purpose of this process.

Priority

Statements with the subject priority which is given to the tasks that come with the IT IC process.

Work Efficiency

Statements with the subject efficiency of the IT IC process.

Collaboration

Statements with the subject collaboration with the control owner, control executor/IT specialists, IT IC team and involved third parties (e.g. external control auditors).

Reasonable Assurance

Statements with the subject credibility of the reasonable assurance of being in control. (See Chapter 1 for the definition of IC by Air France – KLM.)

Planning

Statements with the subject planning of the IT IC process.

Recording problem- and non-problem statements

In purpose of the research it was closely monitored how often a certain statement was made. This would indicate how much this statement is experienced among the different roles, platforms and departments. Attention

is paid to whom (control owner or control executor) made the statement, which platform was discussed, and which controls apply to this platform.

While recording how often a statement was made, two assumptions were taken into consideration. The first assumption being the statement a person makes counts per platform he or she is representing. For example, when a person is control owner of platform 1 as well as of platform 2, the statement he or she makes counts two times, one time for platform 1 and one time for platform 2. This assumption is made because this way every platform has statements from its control owner as well as from its control executors. Because of this assumption, the statements made by a person that is control owner of more than one platform have been recorded more than once while it might be emanated from one person.

The second assumption that was taken into account is when a role for one platform is fulfilled by more than one person every statement made by either one or both of these persons only counts once. I.e. when the role of control executor/IT specialist for platform 1 is fulfilled by person A and person B, and person A and B both make the same statement, the statement counts as one. The reason for this assumption is that this way a platform with more than one person as control owner or control executor/IT specialist, who both mention the same problem and/or non-problem, don't necessarily have more problems and/or non-problems.

With these two assumptions the results of this research represent the perspective on the IT IC process, according to every role (either control owner or control executor/IT specialist) on every platform. Regardless of how many actual persons fulfill this role and/or how many platforms one specific person is representing.

3.3 Prioritization of the statements

Because the statements are opinions based on personal experiences of the control owners and control executors/IT specialists, the statements need to be prioritized for their relative importance. A statement that is mentioned most, doesn't necessarily mean that it has the highest priority when improving the collaboration between the control owners and control executors and the IT IC team to optimize the IT IC process. Apart from how often a statement is mentioned, it has to be known whether the problem or non-problem is influenceable by the IT IC team. A problem that is not influenceable by the IT IC team cannot be improved. When a statement is influenceable it should be known how big the impact of the problem or non-problem is on the IT IC process. The bigger the impact on the IT IC process the more priority should

be given to the statement, because this will improve the IT IC process the most.

Influenceability of the statement and impact on the IT internal control process

To gather the information needed for the prioritization of the statements, a group interview was set-up with the IT IC team. This interview was structured with only multiple-choice questions. A list of all the statements made by the control owners and control executors was presented to the IT IC team. Per statement the following questions were asked:

- Is this problem or non-problem influenceable by the IT IC team? (Yes/No)
- How big of an impact does this problem or non-problem has on the IT IC process? (Small/Medium/Large)

The answers to these questions are given by the IT IC team in a group meeting, where there was consensus of the total group per answer.

3.4 Solving the problem statements

To provide the IT IC team a recommendation on how to improve the collaboration the final research method that was used was a literature study on the three problems with the highest priority. With this literature study a solution for these problems was found.

The search for relevant literature was conducted by the following steps:

1. Defining the search terms

   The three main subjects of the search terms became respectively the three problems with the highest priority. Per subject the search term may differ using synonyms or extra terms to specify the search for a more relevant result.

2. Defining searching criteria

   For the search of relevant literature FINDUT, the search engine of the University of Twente was used. Within this search engine searching criteria were defined with the aim to find relevant and useable literature. The searching criteria that were used are:

Content:	Full text
Material type:	Downloadable article

3. Selecting relevant literature

The search as described by the previous steps resulted in many potentially relevant articles. To decide whether an article was useable and relevant first the ‘overview’ section was read. When the section was found relevant the article was downloaded and read.

With the help of these articles a solution to the problems was found as described in section 4.7.

4. Results

This chapter discusses the results taken out of the data received from the interviews. The results consist of 54 problem- and non-problem statements. In this chapter we firstly discuss the overall results, after that a distribution of the statements per category is depicted. Next, we discuss some contradictions between the statements, after which the prioritization of the statements is given. Followed by graphs that show the statements per department, platform and role. The result tool is discussed afterwards and as last part of this chapter a solution to the top 3 problem statements is discussed.

4.1 Overall results

When considering all the statements made during the interviews, the statements depict the overall problems and non-problems of the IT IC process and collaboration with the IT IC team according to the control owners and control executors. As mentioned in part 3.2 the subject of every statement is determined, resulting in the statements being divided among seven categories. All the problem and non-problem statements and their category can be found in appendix A Statements. Also, in this appendix every statement has a code, from now on every statement is referred to by its code. This code tells the category of the statement and if the statement is a problem or non-problem statement. This is shown in Table 1.

Table 1 Statement codes

Category	Code letter	Problem statements code	Non-problem statements code
Collaboration	C	C1, …, C10	C11, …, C15
Awareness	A	A1, …, A10	A11, …, A13
Work efficiency	W	W1, …, W5	W11
Reasonable assurance	Re	Re1, …, Re7	Re11, Re12
Role	Ro	Ro1, …, Ro4	Ro11, …, Ro15
Planning	Pl	Pl1, …, Pl3	
Priority	Pr	Pr1, …, Pr4	

Table 1 Statement codesalso tells how many different problem and non-problem statements are mentioned per category. Most different problem statements are mentioned within the categories collaboration and awareness. About the categories planning and priority there are only problem statements mentioned. Most different non-problem statements are mentioned about the categories collaboration and role.

4.2 Statements per category

A distribution of the number of times a statement of a certain category is mentioned is depicted in Figure 4 Distribution of the statements per category.

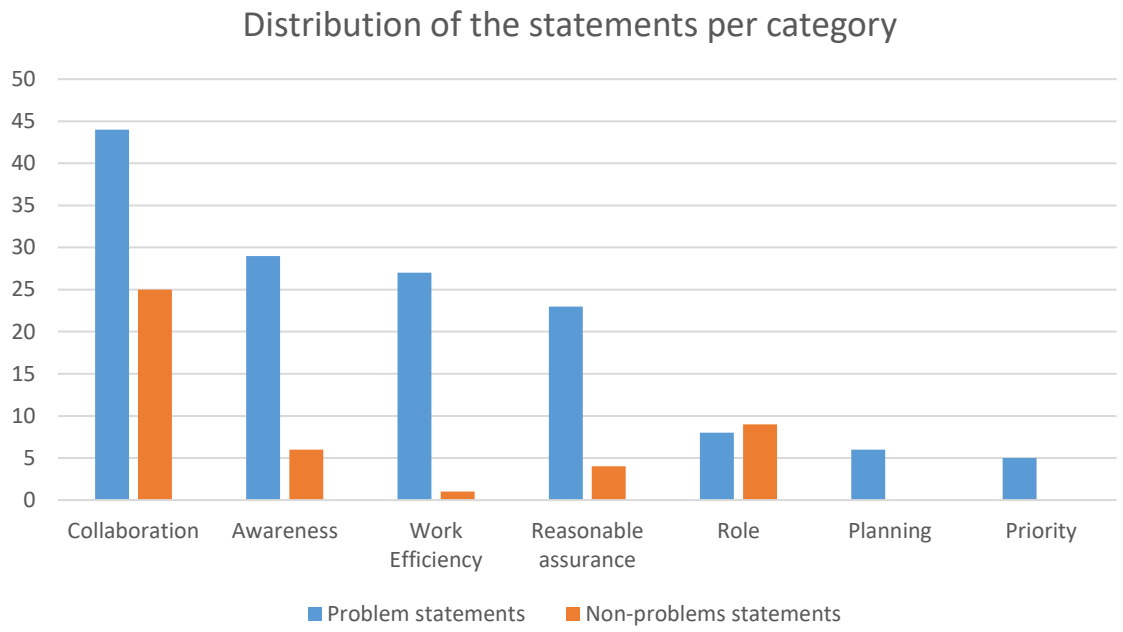


Figure 4 Distribution of the statements per category

Looking at how often a statement is made per category most of the problems as well as non-problems have to do with collaboration. Least problems are mentioned about priority. The biggest difference between problem and non-problem statements can be seen within the category work efficiency.

4.3 Problem statements versus non-problem statements

The problem and non-problem statements show in some cases contradictions. What some control owners and control executors consider as a problem, are named as a non-problem by others. A list of these contradictions can be seen in Table 2.

Table 2 Contradictions problem and non-problem statements

Code	**Problem statement**	**Code**	**Non-problem statement**
C6	One auditor from the IT internal control team should be in contact with the IT platform concerning IT internal control	C11	Contact with the auditors of the internal control team is pleasant
C8	Status report is not as frequent as it used to be	C13	ITGC self-testing results are reported properly

A1	No awareness of the documents listed in the IT internal control framework	A11	Aware of the documents listed in the IT internal control framework
W3	Controls should be more automated on the IT platforms	W11	More controlling is automated in the process
Re1	There are processes on the platform that might need auditing too	Re12	Controls that are applicable to the platform/process are sufficient for the respective platform/process
Ro3	The IT internal control team should utilize their role as advisors more/stronger	Ro14	The performance of the role of the internal control team as advisors when solving an issue is considered good

While some control owners and control executors are aware of the documents listed in the IT internal control framework, others are not. Apart from these contractions there are also contradictions within either the problem statements or non-problem statements. These are shown in Table 3Table 3 Contradiction within problem or non-problem statements. As mentioned in Table 4 the code of the statement says whether the statements are problem or non-problem statements.

Table 3 Contradiction within problem or non-problem statements

Code	Statement	Code	Statement
C5	Status updates should be more efficient by only providing updates when there are issues	C10	There is no notification when 'in control' and/or when self-tests are not performed
Re3	ITGC self-testing could be improved by applying the rules stricter	Re4	ITGC self-testing is (too) much in depth and/or strict
Ro13	ITGC self-testing is not a required task to be performed by the control executor	Ro15	ITGC self-testing is a task to be performed by the control executor
Pr1	Risk estimation is lower than named in the internal control framework	Pr2	Risk estimation is higher than named in the internal control framework

For these contradictions applies that while some find the ITGC self-testing too strict (Re4), others find that it could be stricter (Re3), both being a problem statement.

4.4 Prioritization of the problem statements

The statements need to be prioritized for their relative importance. When prioritizing the problem statements, the statements are sorted by influenceability from yes to no, effect on IT IC process from large to small (large, medium, small) and number of times that the statements is mentioned from high to low. This resulted in a list depicted in

Table 4

Table 4 Prioritization of the problem statements

Statement code	Influenceability	Effect	#mentioned
W3	yes	Large	14
A5	yes	Large	7
A7	yes	Large	7
Ro3	yes	Large	5
W2	yes	Large	5
Re2	yes	Large	5
Re3	yes	Large	5
W4	yes	Large	4
C4	yes	Large	3
C7	yes	Large	3
Re4	yes	Large	3
A10	yes	Large	2
A4	yes	Large	2
A8	yes	Large	2
Pr3	yes	Large	1
C3	yes	Medium	17
A9	yes	Medium	2
Pr4	yes	Medium	2
C6	yes	Medium	2
C9	yes	Medium	2
Pl2	yes	Medium	2
W1	yes	Medium	1
Re1	yes	Medium	1
Re7	yes	Medium	1
C2	yes	Small	8
C5	yes	Small	6
Re6	yes	Small	6

A3	yes	Small	4
W5	yes	Small	3
Pl3	yes	Small	3
Re5	yes	Small	2
Ro1	yes	Small	1
Ro2	yes	Small	1
Ro4	yes	Small	1
A1	yes	Small	1
A2	yes	Small	1
A6	yes	Small	1
Pr1	yes	Small	1
Pr2	yes	Small	1
C10	yes	Small	1
C8	yes	Small	1
C1	no	-	1
Pl1	no	-	1

The statements C1 'Collaboration with IMO is not running smoothly' and Pl1 'It is not clear in advance which ITGC self-tests will be performed by the external auditor and to which requirements they have to comply' are the only two statements that are not influenceable by the IT IC team, both also mentioned once. 15 of the other 41 statements are labeled as large, for having a large effect on the IT IC process. Among these 15, the most mentioned statement is W3 'Controls should be more automated on the IT platforms', which is mentioned 14 times. The two most mentioned statement after this one, both mentioned seven times are A5 'There should be access to general information and documents concerning internal control. E.g. a platform or dashboard' and A7 'The IT internal control framework should be clear and unambiguous. It should not be possible to interpret things differently'.

4.5 Statements per department, platform and role

Apart from prioritizing the problem statements, the results also show the distribution of the statements over the departments, the platforms and the roles. Figure 5 shows the the distribution of the statements that are influenceable and have the largest effect on the IT IC process are shown.

Problem statements per department

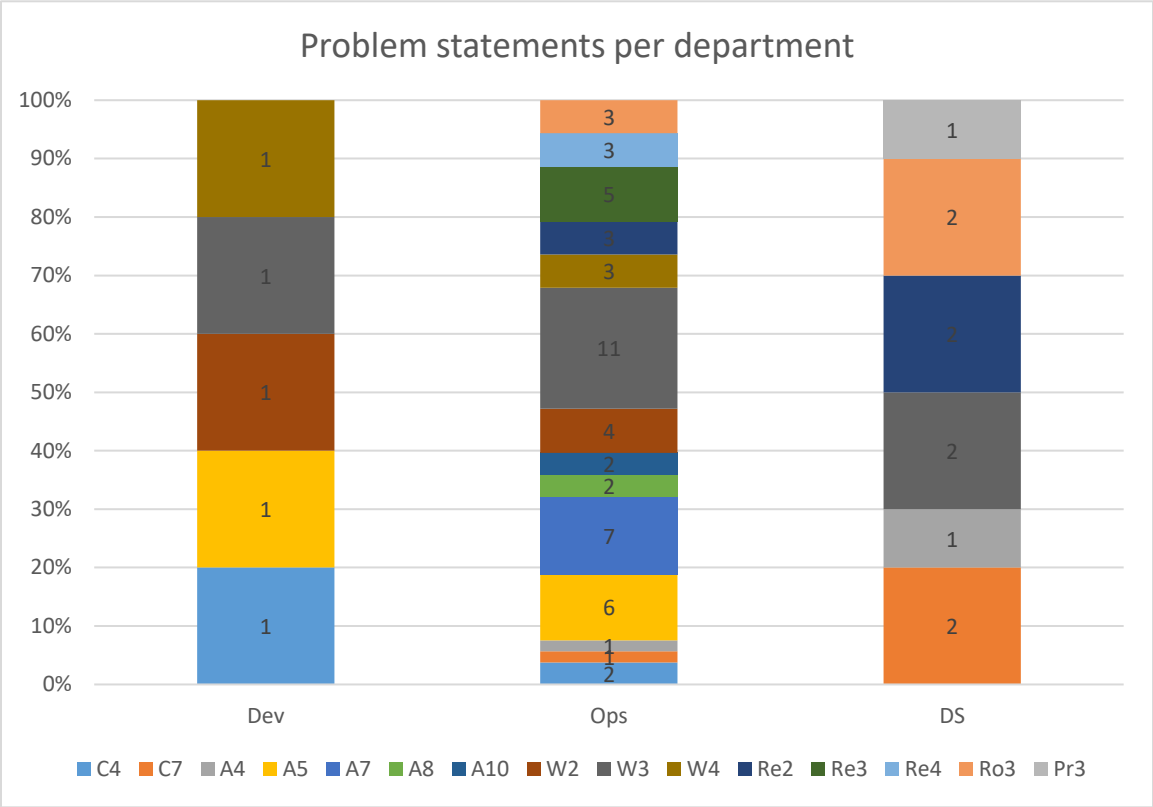


Figure 5 Problem statements per department

Problem statement C4 'The knowledge transfer to new staff who will be involved in the internal control process should be improved' is mentioned once for the development department and twice for the operations department. However, this statement takes a much smaller part for operations than for development considering all problem statements made for the department. A statement that takes the most and about the same part in all the departments is statement W3 'Controls should be more automated on the IT platforms'. For de operations department it is notable that there are more different problem statements mentioned than for the development and distributed services department.

Problem statements per platform

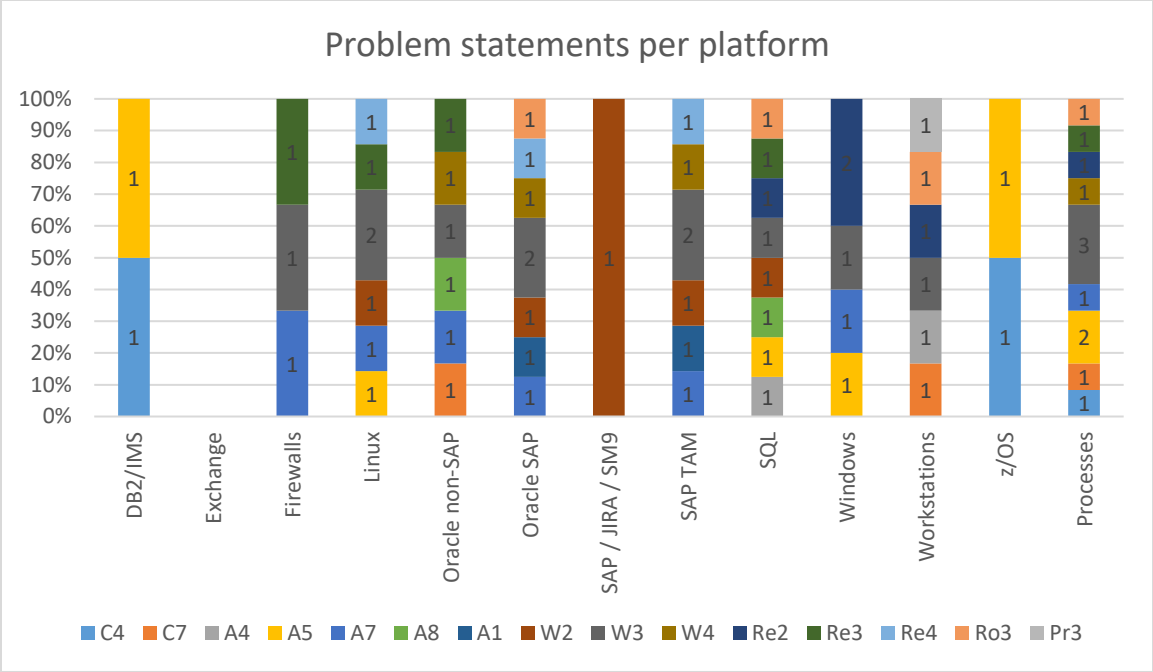


Figure 6 Problem statements per platform

When looking at the problem statements with a large effect on the IT IC process the Exchange platform does not have any. SAP/JIRA/SM9 has one, W4 'Controls should be arranged more efficiently'. The not platforms, but different processes that need ITGC self-testing have most, among which W3 'Controls should be more automated on the IT platforms' is mentioned most. This same statement applies to most of the platforms, with the exception of DB2/IMS, Exchange, SAP/JIRA/SM9 and z/OS.

Problem statements per role

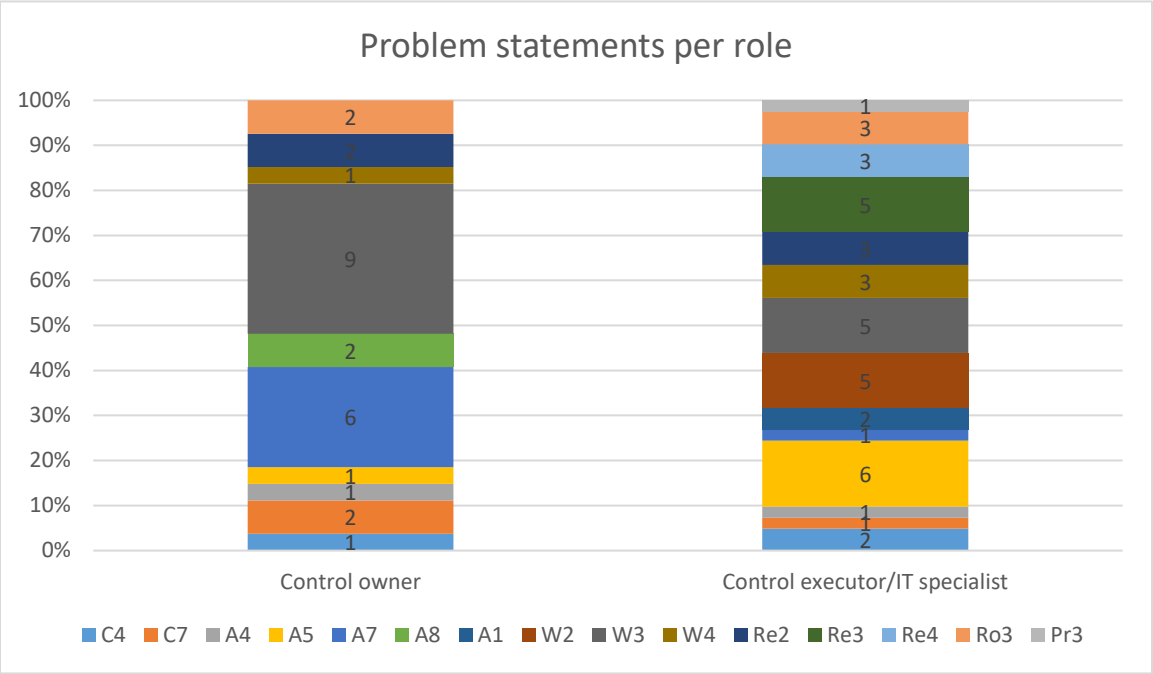


Figure 7 Problem statements per role

Among the control owners, the statements that are mentioned most, are W3 'Controls should be more automated on the IT platforms' which is mentioned 9 times and A7 'The IT internal control framework should be clear and unambiguous. It should not be possible to interpret things differently' which is mentioned 6 times. W3 also takes a large part for the control executors however statement A5 'There should be access to general information and documents concerning internal control. E.g. a platform or dashboard' is mentioned most. There is a lot of overlap between the statements that are mentioned by the control owners and control executors. Only mentioned by control owners is statement A8 'Everyone (including third parties) should be aware of the content and number of controls named in the internal control framework'. The statements that are only mentioned by control executors are A1 'No awareness of the documents listed in the IT internal control framework', W2 'The IT internal control team does not have self-serving access to evidence', Re3 'ITGC self-testing could be improved by applying the rules more strict' and Re4 'ITGC self-testing is (too) much in depth and/or strict'.

4.6 Result tool

When taking a look at the total results one can come up with the question, 'does a particular statement apply to all platforms or only one or maybe two?'. Apart from the total results, the problem and non-problem statements can also be approached from a certain role, department, platform, control or even

a combination of one or more of these entities. For instance, it could be very interesting what problems statements of the category collaboration were mentioned by the control owners of the operations department.

To easily answer any sort of these questions with a list of problems and/or non-problems a result tool was set up. This tool is made in Microsoft Excel and consists of a dashboard sheet, a result sheet and a graph sheet. The tool works with the help of VBA codes, buttons, forms, and hidden sheets, some to help the codes others filled with data.

On the dashboard sheet there is the option to generate the results, being a list of problem and/or non-problem. When selecting the results button, a form comes up. On this form you can select what results you want to generate. You can select the sort of statements being problem statements and/or non-problem statements, but also the category of the statements. Further you can specify which statements you want to show depending on the role, the departments, the platforms and/or the controls.

As an example a form on which problem statements from the category Collaboration by Control owners from the Dev department is selected, as in Figure 8, will generate all the problems in the category collaboration mentioned by the control owners of the development department.

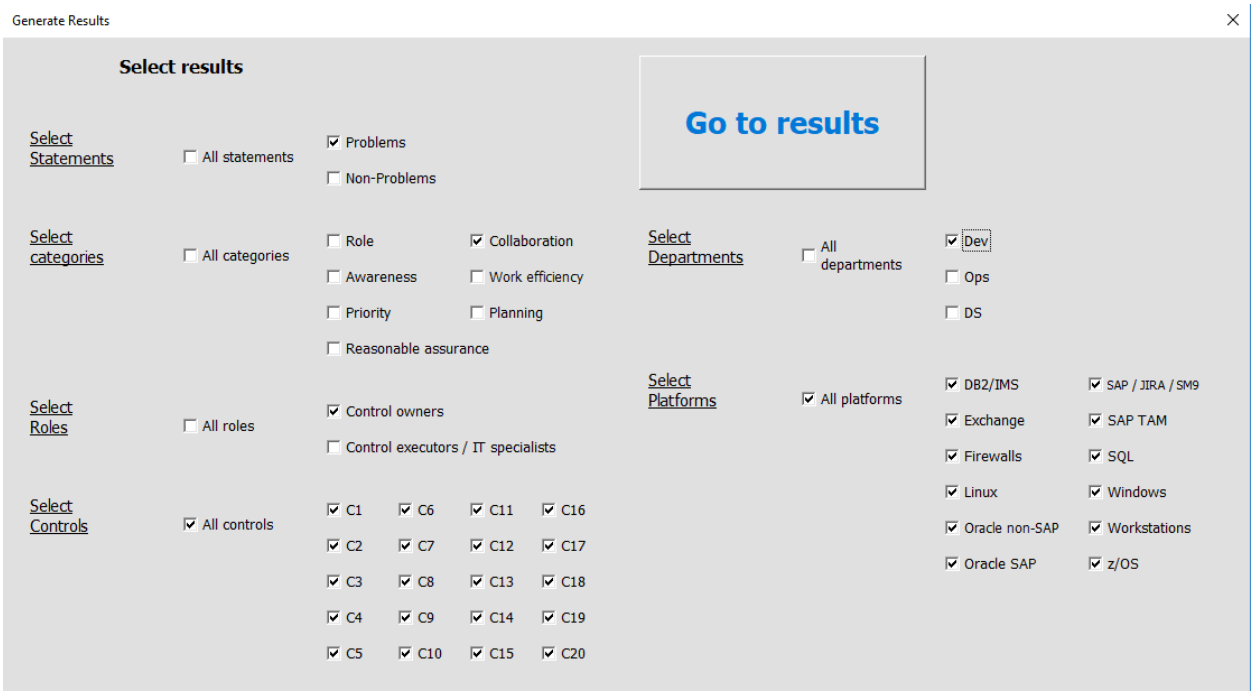
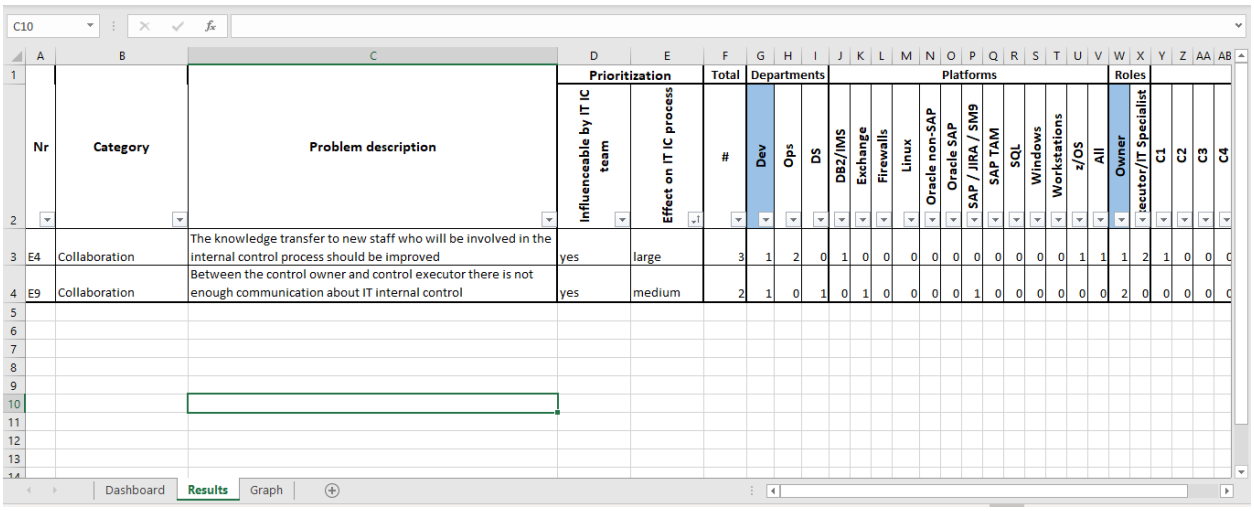


Figure 8 Generate results form

The results will be shown as in Figure 9.



				Prioritization		Total	Departments			Platforms														Roles					
	Nr	Category	Problem description	Influenceable by IT IC team	Effect on IT IC process	#	Dev	Ops	DS	DB2/IMS	Exchange	Firewalls	Linux	Oracle non-SAP	Oracle SAP	SAP / JIRA / SM9	SAP TAM	SQL	Windows	Workstations	z/OS	All	Owner	Executor/IT Specialist	C1	C2	C3	C4
3	E4	Collaboration	The knowledge transfer to new staff who will be involved in the internal control process should be improved	yes	large	3	1	2	0	1	0	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	0
4	E9	Collaboration	Between the control owner and control executor there is not enough communication about IT internal control	yes	medium	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0

Figure 9 Generated results

The statements that can be seen on this sheet are the statements as selected on the form. The numbers, however, depict the number of statements mentioned on the corresponding department, platform, role or control in total. This means that figure 9 shows that the problem statement 'Between the control owner and control executor there is not enough communication about IT internal control' is mentioned twice by control owners over all the interviews. Over all the interviews, this same statement is mentioned only once on the development department.

This tool provides insight in the problems and non-problems on any department or platform or any role. The IT IC team can use this tool to adjust their process according to the preferences of any entity.

4.7 Solutions to the top problem statements

While it depends on which entities you base the prioritization of the problem statements, the three problem statements with the highest priority in general are

- W3 'Controls should be more automated on the IT platforms'
- A5 'There should be access to general information and documents concerning internal control. E.g. a platform or dashboard'
- A7 'The IT internal control framework should be clear and unambiguous. It should not be possible to interpret things differently'

By conducting a literature review as described in section 3.4 a solution for each of these problems is drafted.

Automating controls on the IT platforms

Current situation

Currently some platforms automated the controls for their processes, meaning that they deliver evidence for the control with a high frequency, if not continuous, by using IT. This provides advantages for both the control executors as for the IT internal control team. Evidence is almost immediately ready and deliverable, which saves a lot of time for both parties.

If a platform automizes their controls is for them to decide, it is not an obligation given by the IT internal control team or any other, higher, party. In this research control owners and control executors indicate that automating the control would benefit their experience with IT internal control. Automating the controls is not easily done, it takes a lot of knowledge about the processes and the controls. Besides the required knowledge, it also takes a lot of time to design the controls and implement them. These disadvantages are the reason that most platform didn't automate their controls yet.

The design and implementing part of automizing the controls is considered as a responsibility of the platform and the control executors of the platforms. However, the IT internal control team has a part in this process as well. In the process of automizing the controls the IT internal control team functions as a consultative party.

The IT internal control team should know how to elaborate their role as consultants in this process in order to improve the efficiency and effectiveness of automating the controls, making it more likeable for the other platforms to also automize their controls.

Literature

In 2006 the monitoring and control layer for continuous monitoring of business process controls (CMBPC) was implemented in the IT audit department of Siemens Corporation. A report was written on the approach that was developed for the implementation and the lessons that were learned during the implementation. This report states several inferences and findings about (internal control) auditors during this implementation process (Alles, Brennan, Kogan, & Vasarhelyi, 2006):

- CMBPC require both managers and auditors to verify controls over the firm's financial reporting processes.
- While formalizing the AAS's, the participation of the senior internal auditors was essential. Ambiguities and uncertainties were resolved and the formalized versions of the AAS's were validated.
- It is important that to assure that every formalization is discussed by at least two experienced auditors to uncover and resolve possible ambiguities and diverging interpretations.

- The process of re-engineering controls by experienced auditor for purposes of formalization of controls leverages automation to produce more efficient methods of addressing key controls.

- Throughout an audit, auditors are instructed to perform review procedures varying from simple checks of standard system parameters to securing more subjective data requiring input from interviews.

- The degree of compliancy of an audit action sheet (AAS) (the scope of the audit) given by the internal control auditor depends on the score given on this AAS by the continuous auditing analyzer code.
- The continuous auditing analyzer also provides flexibility for the auditor to further formalize the evaluation and scoring process without making hard-coded programming changes.
- The AAS's provide general guidelines for the auditor to reconcile the weighting of scores, which were problematic when programming intelligent software. A challenge of the continuous audit analyzer and the scores that it assigned to the AAS's was that often the scoring criteria were ambiguous or vague, causing the auditor to have to score the findings
- The tab 'components used for scoring' allows the auditor or operator to define the control elements to be included in the evaluation and scoring.

- A continuous auditing system will always send an alarm to the auditors when there is an exception, a deviation in the value of the control. Optionally this alarm can also be sent to responsible enterprise personnel and/or enterprise managers, as well as other relevant parties.
- While alarming is critically important in CMBPC since it makes it possible to correct the identified problems in close real time, if the number of alarms generated by the CMBPC system explodes then it will hamper the ability of auditors and other enterprise personnel to react and correct the identified problems
- The ongoing maintenance of the configuration of individual alarm conditions is a laborious process, which may require an inordinate amount of auditor's time if the CMBPC system is not designed to alleviate this problem.

- The monitoring and control layer is implemented in a separate computer system, which is usually owned and operated by the auditor.

Automating controls on the IT platforms

Through the CMBPC implementation at Siemens we learn that the IT internal control is involved in more than just consulting. When implementing the atomization of the control on the IT platform the IT internal control is involved in:

- Formalizing the controls; This part mainly consist of consulting. To formalize the controls to automate them in the IT processes the IT internal control

team has to consult the programmers. These programmers are the control executors of the IT process. In order for the programmers to program an efficient and effective control the control can't be ambiguous or vague. This is where the consult of the IT internal control team is needed. Based on experiences of Alles, Brennan, Kogan & Vasarhelyi, to solve the ambiguousness and vagueness at least two IT internal auditors should be consulted, preferable senior auditors.

- Providing input; When the controls are formalized, in some cases it will still not be possible for the CMBPC to score every aspect of the control. As in the current situation, some input is given by interviews with the control executors. For these cases it is not possible to fully automize the controls, some manual work is necessary to score the compliancy of the control.
- Using continuous auditing analyzer; To score the controls on level of compliancy an analyzer should be used. The analyzer scores the controls based on the CMBPC. The final decision on the level of compliancy, given by the IT internal control team, is based on the score given by the analyzer. Such an analyzer can provide flexibility by even further formalize the controls and changing the conditions on which the score is based. This is however, according to Alles, Brennan, Kogan & Vasarhelvi, not error resistant. In practice, the controls might not be formalized enough, resulting in controls that are still ambiguous and vague, causing the IT internal control to determine the level of compliancy.
- Alarms; When the CMBPC is in use, it will send alarms to the IT internal control team every time the process is divergent from the controls. The IT internal control will have to react to such an alarm. When there is an overflow of alarms, to be expected when the CMBPC is newly in use, this will obstruct the ability of the IT internal control team to react. This can be prevented to some extend by the design of the CMBPC.

To stimulate all the platforms to automize the controls, the IT internal control team should elaborate their involvement with more than just consulting. When the IT internal control will use this automized controls for their auditing processes by providing input, using the analyzer and the alarms they can improve the productivity of their auditing process. This will give the control executors more motivation to invest time and money in automizing their controls, not only to get insight in the compliancy levels of their controls but also improving the productivity of the auditing process when being audited by the internal control auditors.

Access to general information and documents concerning internal control

Current situation

Currently Air France – KLM uses Microsoft SharePoint as a platform to store and share information within the company, also the IT internal control team uses this platform to share all the relevant information concerning IT internal control with their stakeholders within the company. Nevertheless, the access to general information and documents concerning IT internal control (problem statement A5) is mentioned as a problem by both control owners and especially control executors. While every stakeholder within Air France – KLM should be able to access this information, especially the control executors should be able to know where to easily find the information because for them IT internal control is a more day-to-day subject.

According to Microsoft Corporation, SharePoint is an intranet platform to easy share and effortless collaborate, to provide involvement in the organization, to use common knowledge and to transform business processes. (Microsoft Corporation, sd). However, there might be more alternatives on the market, SharePoint should be a suited platform for accessing general information and documents concerning internal control. Also, changing to another platform for one of the many business processes is largely inconvenient when not absolutely necessary. The application of SharePoint should rather be improved.

literature

Brown and Duguid suggests that to benefit a company, the company should dynamically coordinate different types of knowledge among different communities, within a community of practice environment. Coordinating this knowledge within the community, while ignoring the differences in practice raises difficulties. These difficulties include stickiness due to the differences in labor but also leakiness due to routines in common practices. A community of practice being a continuous source of knowledge, makes it necessary as well as challenging for a company to dynamically coordinate innovative and routine knowledge. Brown and Duguid argue that coordination of knowledge in a community of practice doesn't solely depend on motivation and trust but addressing knowledges differences due to differences in labor as well. Such differences can cause one party to change an object, unintentionally damaging communication, coordination and trust within the community of practice. The use of shared documents, tools, business processes, objectives, schedules etc. not only coordinates but also record and signals changes in a community. This will stimulate different practices to reconsider their changes, and so, stimulate negation between the different practices. (Brown & Duguid, 2001)

Access to general information and documents concerning internal control

The IT IC team and the control owners and control executors are three communities, sharing different objects in the form of, for instance, controls, which means they can be seen as a community of practice. But also other objects in the form of information and documents as schedules and status reports. According to Brown and Duguin, to coordinate this knowledge the focus should be on motivation and trust between the different practices but also these sharing objects as schedules to stimulate

negotiations. In the current situation the sharing objects shared on SharePoint are only managed by the IT IC team and used as routine knowledge by control owners and control executors. To improve the coordination of these information and documents, these documents should be adjustable in regard to the knowledge of the control owners and control executors. In practice this means that for instance, the schedule on SharePoint could be dynamic in a way that every control owner and/or control executor/IT specialist can change or suggest changes according to their schedules. This way motivation, trust as well as negotiations for/in and about these shared objects are stimulated.

Apart from the sort documents that are shared on SharePoint, it might be useful to research how they are shared. Because at this point in this research it is not possible to gather detailed information on how SharePoint is used by the IT internal control team and its stakeholders, it is also not possible to research how they can improve the use. Building the SharePoint User Experience (Furuknap, 2009), describes in detail the SharePoint architecture and how to develop SharePoint pages, attributes, lists, columns etc. that have an impact on the user experience. Furuknap his instructions, tips and tricks can be very useful when known what parts of the SharePoint should improve.

By taking into account the user experience while developing de SharePoint pages, the IT internal control team could solve the problem the IT internal control owners and executors have with access to general information. The book written by Furuknap (2009) gives guidelines for developers to do so.

A clear and unambiguous IT internal control framework

Current situation

The IT internal control framework as describes in section 2.5 is currently not clear enough for the IT internal control owners and executors. The controls as stated in the framework can be ambiguous in a way that it's not clear what has to be done about the process to be compliant with the controls.

Every financial year the internal control team will decide whether to make changes to the framework or not. This decision depends on changes in the organization structure and/or processes within IT or changes in the risk matrix. Another reason for adjustments to the framework are changes in the CobiT. However, changes to the framework do happen, these adjustments only consist of changing the platforms or processes to which the controls apply, changing the risk matrix or adding new controls. Changing the control itself is not possible for the IT internal control team because the controls as stated in the IT internal control framework are directly based on CobiT. Unfortunately for the IT internal control owners and control executors this means that there is no easy and effective solution to this problem by changing the formulation of the controls. It must be looked at how to adjust the framework in order for the control owners to know how to effectively be compliant with the controls.

The IT internal control team makes agreements with the control executors on what has to be done in the process to be complaint with the controls in a meeting in the early phase of an ITGC self-test. However not every process or platform has an ITGC self-test every year, which means that not every control owner or control executor/IT specialist makes these agreements on a regular basis. Another thing to look at is how to keep track of these agreements. This way the control owners and executors know that has to be done in the process to be complaint with the controls, independently from the IT internal control framework at all times.

Literature

According to S.J. Hussain and M.S. Siddiqui (2005) the CobiT framework can be improved by applying it even more effective. They suggest to do this by adding matrices to the framework to make it quantitative. The CobiT frame has four domains, Planning & Organization, Acquisition & Implementation, Delivery & Support and Monitoring. As seen in figure 10, there are IT processes assigned to a domain and for every process the degree of information criteria (P=primary, S=secondary) and IT resources are determined.

IT Processes			Information Criteria							IT Resources				
DOMAIN	Process Code	PROCESS	Effectiveness	Efficiency	Confidentiality	Integrity	Availability	Compliance	Reliability	People	Application	Technology	Facilities	Data
Planning & Organization	PO1	Define a Strategic IT Plan	P	S						✓	✓	✓	✓	✓
	PO2	Define the information architecture	P	S	S	S					✓			✓
	PO3	Determine technological direction	P	S								✓	✓	
	PO4	Define the IT organisation and relationships	P	S						✓				
	PO5	Manage the IT investment	P	P					S	✓	✓	✓	✓	
	PO6	Communicate management aims & direction	P					S		✓				
	PO7	Manage human resources	P	P						✓				
	PO8	Ensure compliance with external requirements	P					P	S	✓	✓			✓
	PO9	Assess risks	P	S	P	P	P	S	S	✓	✓	✓	✓	✓
	PO10	Manage projects	P	P						✓	✓	✓	✓	
	PO11	Manage quality	P	P		P			S	✓	✓	✓	✓	
Acquisition & Implementation	AI1	Identify automated solutions	P	S							✓	✓	✓	
	AI2	Acquire & maintain application software	P	P		S		S	S		✓			
	AI3	Acquire & maintain technology infrastructure	P	P		S						✓		
	AI4	Develop and maintain procedures	P	P		S		S	S	✓	✓	✓	✓	
	AI5	Install and accredit systems	P			S	S			✓	✓	✓	✓	✓
	AI6	Manage changes	P	P		P	P		S	✓	✓	✓	✓	✓
Delivery & Support	DS1	Define and manage service levels	P	P	S	S	S	S	S	✓	✓	✓	✓	✓
	DS2	Manage third-party services	P	P	S	S	S	S	S	✓	✓	✓	✓	✓
	DS3	Manage performance and capacity	P	P			S				✓	✓	✓	
	DS4	Ensure continuous service	P	S			P			✓	✓	✓	✓	✓
	DS5	Ensure systems security			P	P	S	S	S	✓	✓	✓	✓	✓
	DS6	Identify and allocate costs		P					P	✓	✓	✓	✓	✓
	DS7	Educate and train users	P	S						✓				
	DS8	Assist and advise customers	P	P						✓	✓			
	DS9	Manage the configuration	P				S		S		✓	✓	✓	
	DS10	Manage problems and incidents	P	P			S			✓	✓	✓	✓	✓
	DS11	Manage data				P			P					✓
	DS12	Manage facilities				P	P						✓	
	DS13	Manage operations	P	P		S	S			✓	✓		✓	✓
Monitoring	M1	Monitor the processes	P	P	S	S	S	S	S	✓	✓	✓	✓	✓
	M2	Assess internal control adequacy	P	P	S	S	S	P	S	✓	✓	✓	✓	✓
	M3	Obtain independent assurance	P	P	S	S	S	P	S	✓	✓	✓	✓	✓
	M4	Provide for independent audit	P	P	S	S	S	P	S	✓	✓	✓	✓	✓

Figure 10 Control objective summary table

S.J. Hussain and M.S. Siddiqui their addition to this matrix are columns with the aim to quantify this framework. The columns they add are shown in figure 11.

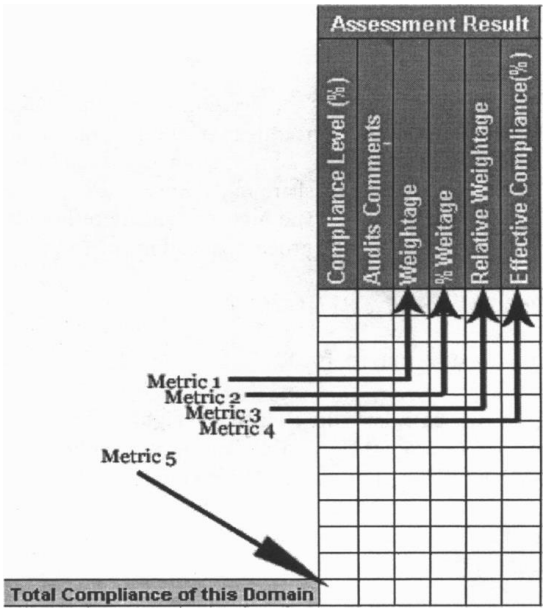


Figure 11 The extended framework model

The first two columns are for the IT internal control team to fill in. The first column is the compliance level in percentage for the IT internal control team to decide based on the audit guidelines provided by CobiT. The second column is to make comments on the motivation for the compliance level. The values of the third to sixth columns are based on calculations.

Weightage: $W = \sum Information\ Criteria + \sum IT\ Resources$; for the information criteria P=1 S=0.5 and blank=0 applies, for IT resources ✓=1 and black=0 applies.

%Weightage: $\%W = \frac{W*100}{W_{\max}}$; W_{max}=12.

Relative Weightage: $\frac{\%W*100}{\sum \%W}$; $\sum \%W$ is calculated for the entire domain.

Effective Compliance: $\frac{Relative\ Weightage*Compliance\ Level}{100}$

Apart from the columns, S.J. Hussain and M.S. Siddiqui also add 4 rows to the framework, for every domain one. In this row they calculate the sum of the weightage, %weightage, relative weightage and effective compliance of all the process within the domain.

A quantified CobiT framework helps to effectively set goals concerning the controls. It also helps with judgements on making adjustments to the processes to achieve a certain level of compliance. (Hussain & Siddiqui, 2005)

A clear and unambiguous IT internal control framework

The first and most relevant solution to clear controls is a better management of the agreements on how to be compliant with the controls. Examples of better management include:

- Meeting minutes

  As other more formal meetings, the control executors and the IT internal control team can make and publish meeting minutes of the meetings in which they make agreements on how to be compliant with the controls. This way both parties can look back to these agreements to prevent misunderstandings about the controls. Publishing these minutes stimulates both parties to be clear and unambiguous and keep updating the latest agreements.
- Regular meetings

  To make sure every control executor/IT specialist knows how to be compliant with the controls, the IT internal control team can set up meetings with every one of them at the beginning of every financial year, regardless of undergoing the ITGC self-testing that year or not. A disadvantage of this measure however is that it will takes both parties more time which they cannot invest in their processes.

The second more indirect solution is quantifying the existing IT internal control framework as suggested by S.J. Hussain and M.S. Siddiqui. By quantifying the framework, the IT internal control team, control owners and control executors have a clear sight on the weightage and compliancy of the IT processes. It gives them insight into what extend they have to adjust their IT processes to reach a certain level of compliancy.

While the IT internal control framework is based on CobiT the layout of the matrix is not the same as figure 10. To quantify the existing model the following steps should be taken.

1. Determine for control the domain; Planning & Organization, Acquisition & Implementation, Delivery & Support or Monitoring.
2. Determine the degree per information criteria.
3. Determine to which IT resources it applies

Most of this information is already stated in the IT internal control framework.

4. Construct the matrix as suggested by S.J. Hussain and M.S. Siddiqui to the IT internal control framework.

   Due to confidentially the new matrix cannot be constructed, however figure 12 shows an approximation of the matrix. The controls (C1…C20) are assigned to random domains, with random information criteria and IT resources, the control description is left out of the matrix.

IT processes			Information Criteria			IT Resources									Assessment Result					
Domain	Code	Control	Effectiveness	Efficiency	Confidentiality	Integrity	Availability	Compliance	Reliability	People	Application	Technology	Facilities	Data	Compliance level %	Audits Comments	Weightage	% Weightage	Relative Weightage	Effective Compliance %
Planning & Organization	C1		P	S						✓	✓	✓	✓	✓			6.5	54.17	28.26	
	C8		P	S	S	S					✓			✓			4.5	37.50	19.56	
	C13		P	S								✓	✓				3.5	29.17	15.22	
	C18		P	S						✓							2.5	20.83	10.87	
	C4		P	P						✓	✓	✓	✓				6.0	50.00	26.09	
																		191.67	**100**	
Acquisition & Implementation	C19		P							✓							2.0	16.67	7.27	
	C11		P	P						✓	✓		✓				5.0	41.67	18.18	
	C3		P							✓	✓	✓	✓	✓			6.0	50.00	21.82	
	C20		P	S	P	P	P	S	S	✓	✓	✓	✓				8.5	70.83	30.91	
	C5		P	P						✓	✓	✓	✓				6.0	50.00	21.82	
																		229.17	**100**	
Delivery & Support	C15		P					P	S		✓						3.5	29.17	12.07	
	C2		P	P								✓					3.0	25.00	10.34	
	C6		P	P		P			S	✓	✓	✓	✓				7.5	62.50	25.86	
	C17		P	S						✓	✓	✓	✓	✓			6.5	54.17	22.41	
	C12		P	P		S		S	S	✓	✓	✓	✓	✓			8.5	70.83	29.31	
																		241.67	**99.99**	
Monitoring	C10		P	P		S				✓	✓	✓	✓	✓			7.5	62.50	19.74	
	C7		P	P		S		S	S		✓	✓	✓				6.5	54.17	17.11	
	C14		P	P		P	P		S	✓	✓	✓	✓	✓			9.5	79.17	25.00	
	C9				P	P	S	S	S	✓	✓	✓	✓	✓			8.5	70.83	22.37	
	C16			P						✓	✓	✓	✓	✓			6.0	50.00	15.79	
																		316.67	**100.01**	

Figure 12 Addition to the IT internal control framework

When the correct information criteria and IT resources are used for the controls, and the control are assigned to the right domain, the controls are better applicable to processes. Control owners and control executors have a direct and clear sight on the relative weightage of their controls. In this fictive matrix, C20 is has the highest relative weightage, this control has the biggest impact on the level of compliancy of the IT processes. Also, the IT internal control team can use this matrix in the status reports as well. By filling in the compliance level all parties have a clear insight in their effective compliance. This will help them in deciding to what extend they have to adjust their IT processes to reach a certain, sufficient, level of compliancy.

5. Conclusion and discussion

This chapter starts with an evaluation of the research questions. The recommendations, discussed next, are derived from the answers to these questions. The last part of this chapter consist of the limitations of this research and suggestions for future research are described in 5.3 Discussion.

5.1 Answering the research questions

The change in interview structure as described in 3.1 Research method caused research question 2i and 2ii to be incorporated into research question 2 and research question 3 to be incorporated into research question 4. To match the research question numbering in 1.2 This research, the numbering in this chapter skips research question 3.

1. What is the current situation of the IT internal control process?

In the current situation the IT IC team, part the CIOO department of AFKL IT, are testing controls on different platforms. They do this with five IT IC team members. To perform the tests, they have to collaborate with the control owners and control executors of these platforms. The controls are derived from the SOx legislation which means that the controls itself cannot be changed. However, the IT IC team can change other aspects of the IT IC process. In the current situation every IT IC team member has his/her own approach.

2. What is the desired situation of the IT internal control process?

The desired situation differs for every department, platform and role. From the results we conclude that there is no unified desired situation. Especially contradictions within problem and non-problem statements, such as, Re3 'ITGC self-testing could be improved by applying the rules stricter' and Re4 'ITGC self-testing is (too) much in depth and/or strict' show this unified desired situation.

4. How can the IT IC process be optimized?

The IT IC process can most efficiently be optimized by solving the problems statements that are influenceable by the IT IC team and have the highest impact on the IT IC process. Depending on whether the process involves a specific department, platform or role a different statement has a greater part in the problem statements of that specific department, platform or role. Based on the total, results, department, platform and role apart, the list as shown in

Table 4, from top to bottom, is the best way for optimizing the IT IC process. This list indicates that the IT IC team should initially focus on the atomization of the controls on the platforms.

5. How should the IT IC team improve the aspects of the contact and the process that should be improved according to the control owners and executors/IT specialists?

In order to automize the controls the IT IC team should elaborate their involvement by not just consulting but also use the automized controls in their audits. Access to general information can be improved by objects that require involvement of both parties to stimulate motivation trust and negotiations. To have a clear and unambiguous IT IC framework the IT IC team can't adjust the controls as stated in the framework. However, they can clear the controls by frequent meetings. Also, they can gain insight in to what extend they are complain by using a quantified framework.

How can the process of IT internal control be optimized by improving the collaboration between the IT internal control team and the control owners and control executors?

The IT internal control process can be optimized by changing the approach of the process. This should be according to the statements made by the control owners and control executors. Hereby the statements with the highest priority are the statements with the highest impact on the IT IC process and have the largest part on the relevant department, platform and/or role. For most of the departments (apart from 3) this means automating the controls on the platforms.

5.2 Recommendations

Platform specific approach

The first recommendation for the IT IC team of Air France – KLM is to adjust the IT IC process according to the relevant platform. The best way to do so is to clarify as much as possible about the whole process at the first contact with the platform, this includes agreements about evidence for the control and the deadlines. But mostly the statements that are made about that platform should be taken into account in the approach of the ITGC self-testing process. For most of the platforms the biggest improvements can be made with automating the controls on the platform.

To help adjust the IT IC process to a specific platform, it is recommended to use the result tool. With this tool, data received from this research about what aspects of the IT IC process are going well and what needs improvements according to the control owners and control executors is easily accessible and prioritized according to that relevant platform. It is even possible to take into account more specific statements according to for instance, the role of a specific stakeholder of that platform.

Information platform

As seen in Figure 4 Distribution of the statements per category apart from collaboration a lot of problem statements can be traced back to a lack of awareness of IT internal control. However, a lot of information about the IT IC process and ITGC self-testing procedures are available on the internal Microsoft SharePoint page. That is why the second recommendation is to invest time and effort in making a new and/or improved Microsoft SharePoint page. When creating this new and/or improves platform it is important to count in the following aspects:

- It should be clear and easy to use
- It should be complete, any stakeholder of IT IC should be able to find the information they need
- It should be up to date, especially the planning of the ITGC self-testing
- Transfer documents should be available for when there is a change in control owner or control executor/IT specialist.

Elaborate the role of consultants

Apart from consulting the IT IC team should use the automized controls during their internal control processes. This will give the control executors more reason to invest in atomization of the controls. …

Quantify the IT internal control framework

Quantifying the IT internal framework will help the IT IC team in deciding to what extend they have to adjust their IT processes to reach a certain, sufficient, level of compliancy. …

5.3 Discussion

Current dev-ops situation

This research is based on the current situation in which the development and operations departments are operating separately. However, as discussed in 2.1 Departments, this situation is changing. Soon there will be multidisciplinary teams. The recommendations of this research will be outdated when this happens because the collaboration will change is many ways. Not only the stakeholders change but also the ITGC self-testing process will have to change. At this point it is still unknown how this process will change, and thus it is unknown h*ow the process of IT internal control can be optimized by improving the collaboration between the IT internal control team and the control owners and control executors*. For this, a new research should be set-up.

Open ended questions

In 3.1 Research method is mentioned that for this research only open-ended question are used in the interviews. The last two question being very broad. As a consequence, the answers to these questions might be divergent. Which would make the results less reliable. For this research this means in particular that some statements would be mentioned more often, or even more statements would be mentioned when every interviewee were given the same direction through the questions. With the use of test interviews, the different categories of statements would be known beforehand which would make it possible to give more direction to the questions of the interview.

Group interviews

Several interviews were set-up as group interviews with both the control executor and IT specialists. In section 3.1 Research method are two disadvantageous mechanisms discussed that could occur during these interviews. If these occurred is not clear without future research. For this research this means that if they occurred, answers given by the interviewees were limited by the free production of idea and socially acceptable answers. Especially the last disadvantage is likely, because the control executor is in a higher, management, position than the IT specialists. To get more reliable results for this research, these two groups, control executors and IT specialists, should be invited to individual interviews.

References

Acocella, I. (2011). *The focus groups in social research: advantages and disadvantages.* Florance, Italy: Springer Science+Business Media B.V.

Air France - KLM. (2004, 04). *Internal Control Charter.* Retrieved from www4.klm.com.

Air France - KLM. (2017). *Annual Report 2016.* Paris: Havas Paris.

Air France - KLM. (2017, 02 16). *Full year 2016 results.* Retrieved from www.airfranceklm.com: http://www.airfranceklm.com/sites/default/files/communiques/fy_2016_press_release_en.pdf

Air France - KLM. (n.d.). *History*. Retrieved from www.airfranceklm.com: http://www.airfranceklm.com/en/group/history

Air France - KLM Information Technology Group. (n.d.). *IT Mission*. Retrieved from http://itconnect.airfrance.fr: http://itconnect.airfrance.fr/en/g_content_page/Strategy/IT_Missions.jsp

Alles, M., Brennan, G., Kogan, A., & Vasarhelyi, M. A. (2006). Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens. *International Journal of Accounting Information Systems*, 137-161.

Brown, J. S., & Duguid, P. (2001). Knowledge and Organization: A Social-Practice Perspective. *Organization Science*, 198-213.

Doeringer, P. B., & Piore, M. J. (1970). *Internal Labor Markets and Manpower Analysis.* Cambridge: Harvard Univ.

Furuknap, B. C. (2009). *Building the SharePoint User Experience.* New York, USA: Apress.

Heerkens, H., & van Winden, A. (2012). *Geen Probleem.* Nieuwegein: Van Winden Communicatie.

Hussain, S., & Siddiqui, M. (2005). Quantified Model of COBIT for Corporate IT Governance. *International Conference on Information and Communications Technologies*.

ISO/TMBG. (2009). *ISO Guide 73:2009 Risk management - Vocabulary.*

Kelly, K. (2014). *Creating a collaborative organizational culture.* UCN Executive Development 2014. Retrieved from www.ecxdev.unc.edu: http://www.kenan-flagler.unc.edu/~/media/Files/documents/executive-development/unc-white-paper-creating-a-collaborative-organizational-culture.pdf

KLM. (2015, 06 26). *AIR FRANCE KLM*. Retrieved from www.klm.com: https://www.klm.com/corporate/nl/about-klm/air-france-klm/index.html

KLM. (2017, 04 13). *KLM brengt reuzenpanda's Xing Ya en Wen Wu naar Nederland*. Retrieved from http://nieuws.klm.com/: http://nieuws.klm.com/klm-brengt-reuzenpandas-xing-ya-en-wen-wu-naar-nederland/

KLM. (2017, 05 17). *KLM Royal Dutch Airlines*. Retrieved from www.facebook.com: https://www.facebook.com/KLM/posts/10154655050255773

Lavrakas. (2008). *Encyclopedia of Survey Research Methods.* Thousands Oaks: SAGE Publications.

Microsoft Corporation. (n.d.). *http://products.office.com*. Retrieved from www.microsoft.com: https://products.office.com/nl-nl/sharepoint/collaboration

Appendix A Statements

	Problem statements		Non-problem statements	
Category	Number	Statement	Number	Statements
Collaboration	C1	Collaboration with IMO is not running smoothly	C11	Contact with the auditors of the internal control team is pleasant
	C2	Collaboration between the IT internal control team and internal control team at business/the external auditors should be improved. E.g. evidence gathering	C12	There are good discussions between the control owner/executor and the internal control team
	C3	There should be more IT internal control alignment with Air France	C13	ITGC self-testing results are reported properly
	C4	The knowledge transfer to new staff who will be involved in the internal control process should be improved	C14	The way ITGC self-testing is performed is good
	C5	Status updates should be more efficient by only providing updates when there are issues	C15	When during retest a new issue is found and the old issue is fixed, the old issue will be closed a new issue will be opened. This way issues do not remain open for long.

	C6	One auditor from the IT internal control team should be in contact with the IT platform concerning IT internal control		
	C7	Feedback process on ITGC self-testing and re-test results should be shorter (lead time)		
	C8	Status report is not as frequent as it used to be		
	C9	Between the control owner and control executor there is not enough communication about IT internal control		
	C10	There is no notification when 'in control' and/or when self-tests are not performed		
Awareness	A1	No awareness of the documents listed in the IT internal control framework	A11	Aware of the documents listed in the IT internal control framework
	A2	No awareness of any changes in the documents listed in the internal control framework	A12	Aware of the process and tasks of ITGC self-testing

	A3	Control owner is not aware of content of the controls he/she owns	A13	Control owners knows the status of his/her controls
	A4	No awareness of the ITGC self-testing process on the platform/process		
	A5	There should be access to general information and documents concerning internal control. E.g. a platform or dashboard		
	A6	The role description and associated tasks should frequently be refreshed		
	A7	The IT internal control framework should be clear and unambiguous. It should not be possible to interpret things differently		
	A8	Everyone (including third parties) should be aware of the content and number of controls named in the internal		

		control framework		
	A9	The roles of control owner and control executors should be clear and be assigned in an early stage		
	A10	It is unknown what evidence has to be delivered to the IT internal control team		
Work Efficiency	W1	There is only one IT specialist with knowledge of IT internal control	W11	More controlling is automated in the process
	W2	The IT internal control team does not have self-serving access to evidence.		
	W3	Controls should be more automated on the IT platforms		
	W4	Controls should be arranged more efficiently		
	W5	The controls should be operational and be self-tested in the first stages of a project/platform (e.g. Dev-Ops)		
Reasonable assurance	Re1	There are processes on the platform that	Re11	The IT internal control team is flexible and

		might need auditing too		realistic when there is an issue that needs to be fixed
	Re2	It is not clear when a process is sufficiently in control	Re12	Controls that are applicable to the platform/process are sufficient for the respective platform/process
	Re3	ITGC self-testing could be improved by applying the rules stricter		
	Re4	ITGC self-testing is (too) much in depth and/or strict		
	Re5	It is not clear what the purpose is of the requested evidence		
	Re6	The effort needed to fix an issue is not balanced with the risk/impact of the issue		
	Re7	Prepare to be able to provide reasonable assurance in the future. E.g. agile and dev-ops teams		
Role	Ro1	Name listed in the Mastersheet as control owner is not actually the owner	Ro11	ITGC self-testing is not/barely noticed by the control executor
	Ro2	Control executor does not	Ro12	ITGC self-testing is not/barely

		consider himself as the executor of the control		noticed by the control owner
	Ro3	The IT internal control team should utilize their role as advisors more/stronger	Ro13	ITGC self-testing is not a required task to be performed by the control executor
	Ro4	There is uncertainty about who really is the owner of an issue	Ro14	The performance of the role of the internal control team as advisors when solving an issue is considered good
			Ro15	ITGC self-testing is a task to be performed by the control executor
Planning	Pl1	It is not clear in advance which ITGC self-tests will be performed by the external auditor and to which requirements they have to comply		
	Pl2	The ITGC self-testing is unstructured and unexpected		
	Pl3	All contact moments between control owner and executor should		

		be clear beforehand		
Priority	Pr1	Risk estimation is lower than named in the internal control framework		
	Pr2	Risk estimation is higher than named in the internal control framework		
	Pr3	It is questioned if the control should exist		
	Pr4	Control/issue is not considered urgent		