CHAPTER 4

4 EXECUTION OF STUDY

4.1 INTRODUCTION

The purpose of this chapter is to describe how the study was executed. The first essential element for reliable execution in a multiple-case study is a protocol, since it provides a framework and a guide for what needs to happen and how it needs to happen in each case study. This increases the reliability of the study by ensuring that the same procedures and methods are followed for each case (Yin, 2009:79). A protocol consists not only of the research instruments, but also decisions on how to use them and other supporting documentation regarding the research process. These elements will be further described in this chapter.

The second element of execution that this chapter discusses in more detail is the pilot study. As supported by Yin (2009:92), the pilot study was not a pre-test, but a complete case and was used to refine the case study protocol and the sequencing of data collection and analysis, and to refine the questions for both the semi-structured interviews and the individual team-member questionnaires. The details of how the pilot was executed are provided in this chapter. The pilot was also documented as a full case study and is available in the supplementary documentation.

Data collection consisted of both interviews and questionnaires. This chapter gives the final number of interviews and responses and the sequence in which they were collected, as related to the different units of analysis in the study. Challenges and procedures followed during the data collection stages are also discussed. The protocol was used extensively during data collection.

The next section in this chapter relates to data analysis. As described under the design, an important consideration for data analysis is the extent of mixing of data obtained through the different data collection methods and the extent of mixing of analysis methods in analysing the data. These elements, including the analysis techniques used for both textual data (interviews) and numerical data (questionnaires), are discussed in more detail. The protocol was extended during this stage to include elements of the data analysis components.

All of the effort is worth nothing if the analysis and findings are not documented sufficiently and as completely as possible (Pratt, 2009:856). The last section of this chapter explains how the elements of analysis were consolidated to be able to describe each case as a within-case analysis, and ultimately the multiple-case study as a cross-case analysis and data synthesis. Similar headings were used for the individual cases and the cross-case analysis in Chapter 5.

4.2 THE PROTOCOL

For the purpose of this research study, the protocol was not formally written up in one document, since only one researcher was taking part, but a directory was created on the computer in which all the components of the protocol were copied. The importance of the protocol was to ensure consistency between the cases in terms of both data collection and analysis. The protocol was created in two stages. The first was for the data collection, which included setting up of the interviews and facilitating the interview process itself, as well as the administering of questionnaires. Then a second stage was created for data analysis on both the qualitative and quantitative side.

The components of the protocol that related to the interview phase included:

- an email to the company representative to assist in selection of managers and teams;
- a spreadsheet for keeping track of company details such as the names of the managers, their contact numbers, interview dates and individuals reporting to

the managers, as well as the interview statistics (interview duration, number of direct reports and number of respondents);

- template letters for the managers and the HR and IT representatives;
- informed consent forms;
- the interview schedules for the managers and HR and IT representatives;
- a spreadsheet with three sheets each containing the selected interview questions for the semi-structured interviews (interview guide), which could be printed for the interview file;
- a directory structure for each case; and
- a template for field notes in MS Word for each case.

The protocol elements were used to create a hard-copy interview file at the start of each case, in which the spreadsheet with contact details, manager letters, informed consent forms (either the signed copy or some extra forms), interview schedule and semi-structured questions were placed sequentially. The high-level information pertaining to the research study was also printed and added to the file for reference. The file content and examples of the protocol elements are provided in Appendix D – Case Study Protocol, with the interview file layout provided in Table 13-2. This is the file where handwritten notes were made during the interviews, and where post-interview notes and personal reflections were made on conclusion of, or as soon as possible after the interview.

The interview protocol was extended through the online questionnaires by adding initial emails, reminder emails and “thank you” emails, which were part of what the online questionnaire tool provided for questionnaire maintenance. Even though each team received its own questionnaires, these were copied from a base questionnaire, which included the standard administrative emails. Refer to Appendix C – Online Questionnaires, for examples of these emails.

At the time when the textual analysis started, the protocol was once again extended to include a standard way of reviewing transcriptions, guidelines for coding and types of memos to use in the ATLAS.ti tool. For the questionnaire analysis, the first case

study was used to create a detailed spreadsheet template for the descriptive analysis. This template was thereafter used for the analysis of the questionnaires for each of the cases. The data analysis procedures which were applied per case have been included in 2.4.4 Textual and Qualitative Data Analysis, while the execution of the data analysis techniques are described in Section 4.5 Data Analysis

4.3 THE PILOT

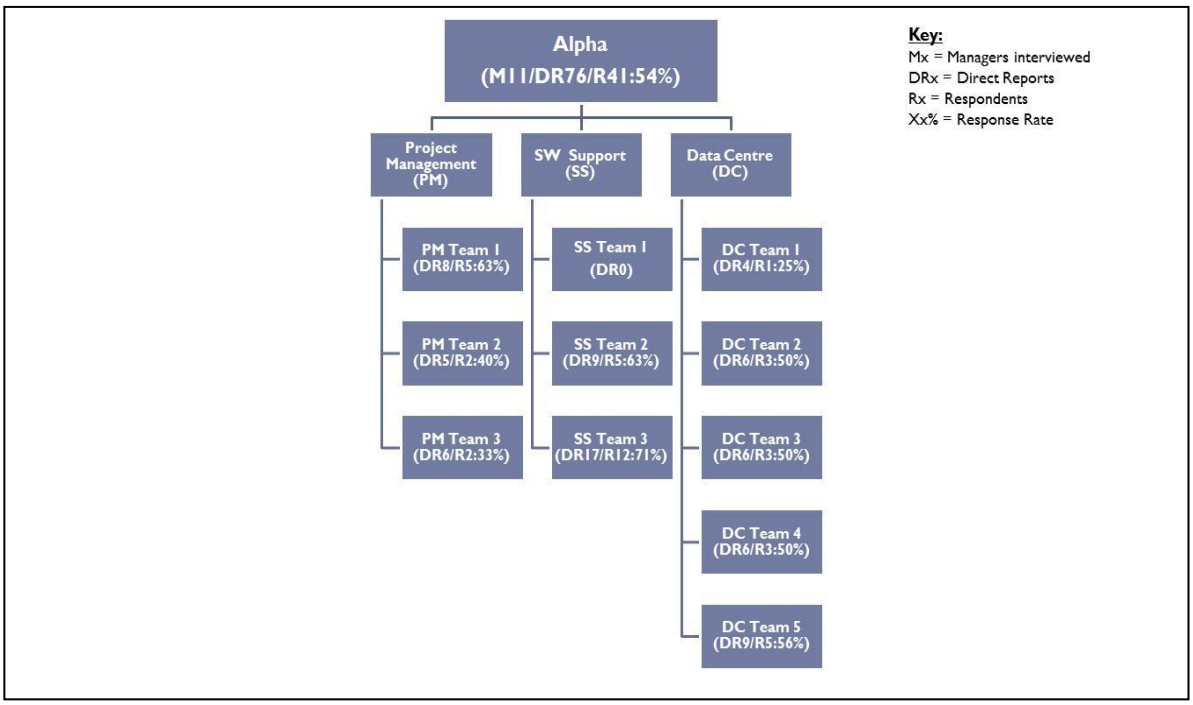
The online questionnaire was initially tested on a small group of individuals who were virtual knowledge workers, but unrelated to the study. Feedback from these individuals was incorporated before the survey was administered to the teams who formed part of the pilot study. The semi-structured question guide was tested on one manager as a test interview, including the initial 14 questions. This took one hour. The manager commented that it was important to ensure that the concept of the "virtual knowledge worker" was understood by the managers, so that they would be clear about who would be classified as such. The importance of explaining the background and definitions used for the study was then added to the protocol. The wording of the questions and their sequencing were also refined. These two tests also proved that the conceptual framework created was workable and ready for execution, and could be used for the pilot study.

The first case study was run as a pilot study to test the protocol and questionnaires and to make any adjustments before the next case was started. To this end, all the data was collected (interviews and questionnaire) and a high-level data analysis was completed. Reflections on the process were updated in the protocol, and changes to questions were incorporated in the online questionnaires and semi-structured interview schedules. The reason why a pilot study was executed was firstly because detailed questionnaires covering all the items of interest did not exist for the team level. So the pilot was used to test the questionnaires for reliability, validity and sensitivity (Zikmund, 2003:300). It also identified some additional questions required for the manager and organisational level interviews. The pilot afforded the opportunity, in the light of the complex case study design, to test the execution and identify improvements for streamlining the process (and protocol) at an early stage in

the research process. The questionnaires were not adapted after the second case study had started, to ensure that the cases, especially on the quantitative data level, were sufficiently comparative.

The company with which the pilot was completed was called Alpha. Eleven teams in total were included. The teams belonged to three business units. The first business unit was Project Management, where three managers were interviewed. The second business unit was the Software Support unit, where three managers were interviewed. The third business unit was the Data Centre, where five managers were interviewed. On the individual level, a total of 76 questionnaires were sent out, of which 41 usable responses were received. This gave a response rate of 54%. The teams and their response rates are shown diagrammatically in Figure 4-1.

Figure 4-1: Response rates for teams in Alpha



During the pilot, there were two sets of adjustments made to the questionnaires, in order to ease the capturing of data, and not necessarily because of inputs from the managers' interviews. During consolidation of the survey data, the versions were added to each team's data, and the mapping of deleted and added questions was done. The researcher made some changes to the sequencing of the questions in the

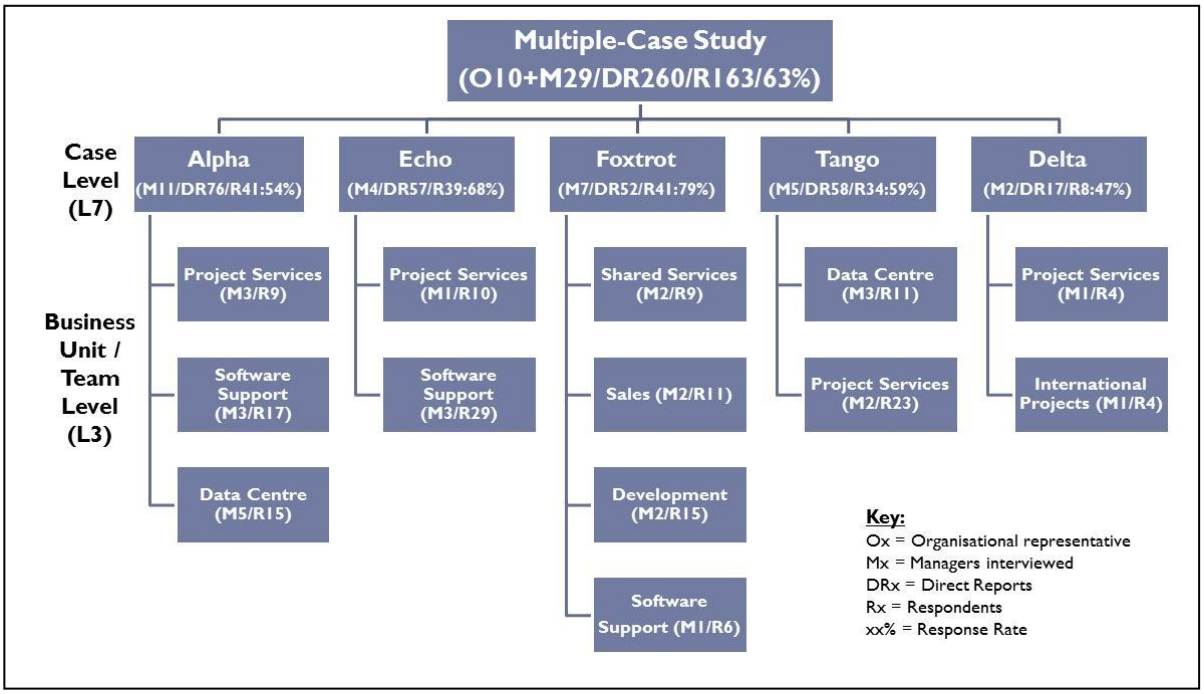
semi-structured interviews, to ensure that the questioning flowed more naturally, and added the actual recording of the request for permission to record. In the subsequent cases, managers were also requested to pre-warn their team members of the questionnaires, so that these would not be seen as an arbitrary email that could be deleted. This resulted in a higher response rate than that obtained in the pilot study.

4.4 DATA COLLECTION

4.4.1 Response Rates

A total of five companies were included as cases for the multi-case study. For anonymity, they were named Alpha, Echo, Foxtrot, Tango and Delta. Figure 4-2 shows the combination of teams in the individual case studies. The numbers in the diagram are used to give the total number of **m**anagers interviewed (M=29), the total number of **o**rganisational representatives interviewed (O=10, or 2 representatives per company), the total number of **d**irect **r**eports (DR=260), the total number of **r**espondents (R=163) and the final response rate as a percentage (63%).

Figure 4-2: Response rate per company



For Alpha, eleven teams in total were included, and they belonged to three business units in one of the divisions. The first business unit was project services, from which three managers were interviewed. The second business unit was the software support unit, from which three managers were interviewed. The third business unit was the data centre, from which five managers were interviewed. On the individual level, a total of 76 questionnaires were sent out, of which 41 usable responses were received. This gave a response rate of 54%.

Four teams were included in the Echo case in the support services business unit, namely one project services team and three support teams. For these teams, a total of 57 questionnaires were sent out. Thirty-nine usable responses were received, of which 39 were complete. The completed responses gave a response rate of 68%.

The Foxtrot case included nine teams, namely two shared services, two development, one support and two sales teams. For these teams, a total of 52 questionnaires were sent, out of which 41 usable responses were received. This gave a response rate of 79%.

Five teams were included in the Tango case, namely two project services and three data centre services teams. For these teams, a total of 58 questionnaires were sent out, from which 34 usable responses were received. This gave a response rate of 59%.

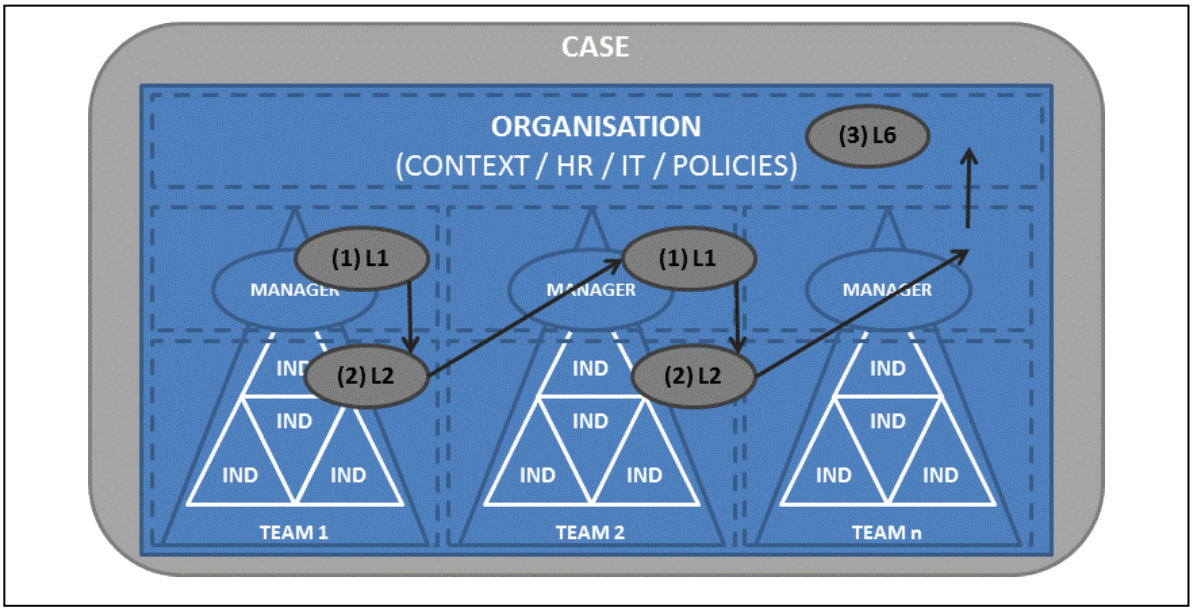
Lastly, for the Delta case, only two teams were included, namely one project services team and one international projects team. For these teams, a total of 17 questionnaires were sent out, of which eight usable responses were received. This gave a response rate of 47%.

4.4.2 Data Collection: Sequencing

As indicated in the design, the timing or sequencing of data collection is important for mixed method studies (Creswell, 2009:206; Denscombe, 2010:135, Teddlie & Tashakkori, 2009:31). Data collection was not necessarily done sequentially per level

in Alpha (i.e. strictly manager, individual, organisational). For example, the organisational-level interview with the IT representative was done first, then the manager interviews and finally the interview with the HR representative. In terms of the collection of the data on individual level, the interview with the manager was always held first, and thereafter the individual questionnaires were sent out. The data collection sequencing is shown in Figure 4-3.

Figure 4-3: Data collection sequence



The sequencing of data collection in the other case studies was similar, with the sequence of manager and organisational level interviews depending on the diaries of the individuals, but the online questionnaires to the individuals reporting to the manager were always sent out only after the manager interview was complete. Even if information regarding the policies was known beforehand (i.e. if the HR interview had occurred before the manager interviews), the aim was still to ask the manager in an objective way about the existence of those policies, to ensure that the actual perception of the manager was recorded.

It was also possible to do the data collection on a case-by-case basis. In other words, all the interviews of one case were completed before the interviews of the next case started. This facilitated a logical flow and coherence of thought for each case. Although questionnaires were sent out directly after the manager interviews, they

were not necessarily closed before collection on the next case started. This was possible because distinct questionnaires (although similar in the questions asked) were sent to each manager's team members.

4.4.3 Data Collection: Interviews

The bulk of the data collected was through the semi-structured interviews conducted with the managers and organisational representatives. To guide the conversation, the semi-structured interviews used the questions that had been created based on the initial literature review. This is in line with the constructivist grounded theory approach (Mills *et al.*, 2006:4–5).

The interview schedule was used to provide an agenda for the interview, and this agenda allowed some time to give the manager additional background on the study and create the ground rules before the actual interview started (manager example in Figure 13-9). Once the background items were completed, consent was asked for the interview to be recorded to ensure reliability and validity. The interview, and later the affirmed consent to record, was recorded on two devices which acted as backup for each other. This proved to be prudent, as in a few cases one of the two devices did not record. There was only one instance in which an individual did not agree to the recording, so more extensive notes were made during the interview and the edited notes were sent back to the individual for corrections. These notes were also imported into ATLAS.ti.

A decision was made at the start of the research to hold all the interviews in English to ensure that no additional translation would be necessary. At the start of the interview the individuals were requested that the interview be done in English. Even though consent was given in all cases, since the business language is normally English, there were times when the individuals did prefer to interject a word or saying in Afrikaans. The researcher also found that the conversation flowed more easily with Afrikaans speakers if she switched to Afrikaans at the beginning or end of the interview. When the data was analysed it did seem that in general the correct meaning was transferred by the vocabulary used in the interview. Only some

grammatical corrections were made during transcription; the wording used as such was not changed. Although a family of documents was created for "Afrikaans" vs. "English" managers, no specific comparative analysis between these two subgroups was done.

An interview guide was used during the interview (refer to the example interview guide in Table 11-1 in Appendix B – Semi-Structured Questionnaires). The questions were constructed in an open-ended way, and allowed for additional inputs from the interviewee, or extension of the questions depending on the answers received. In this regard, some optional questions were placed on the interview guide as well. General notes were also made in the interview file during the interview. This helped to keep track of interesting points that needed further exploration.

In addition to the notes made during the interview, the researcher used the printed interview schedule and interview guide to keep some post-interview notes pertaining to the setting and general mood of the interview, as well as other observations made during the interview (Burden & Roodt, 2007:15). These handwritten post-interview notes were later conveyed to the field-notes document for that case, where initial interpretive notes were added. The field-notes document was later used as a review of the formal first-level analysis and coding completed in ATLAS.ti. This compared the initial thoughts that the interview had elicited with the actual coding, and assisted with additional memoing.

Two mechanisms were used for interviews, namely face to face and remote via teleconference or Skype. In total, eight of the 39 interviews were done via telephone or Skype. In general, it was easier to ask the questions in precisely the way in which they were formulated, since they could be read from the interview guide without losing eye contact with the manager. The managers who were interviewed via this method also seemed comfortable with using the medium, and sharing was perceived to be open and honest. One drawback was that in some cases the network connection was interrupted quite often, leading to interruptions, and re-asking of the questions. Secondly, it was more difficult to capture the attention of the person being interviewed to make an additional comment or if an additional question needed to be asked.

The IT and HR representatives were asked, in addition to the semi-structured interview, to evaluate from an HR and IT perspective existing policies relating to performance management, flexible work hours and support of virtual workers. Not all companies were willing to supply these policies, since they were seen as confidential in nature. As regards HR, the focus was placed on obtaining only the objectives of the performance management policy, and obtaining the wording and the name of the policy that contained flexible work hour principles. As regards IT, only the extent of policies for virtual work was discussed during the interviews. None of the policies or other documents obtained during the interviews were integrated into the dataset in ATLAS.ti. The information obtained on this organisational level was used as a comparative context for the answers received at both managerial and individual team member level.

On completion of each interview, an email was sent to thank the manager, and confirm any detail that was still outstanding, such as name lists of direct reports and examples of performance appraisals.

4.4.4 Data Collection: Questionnaires

The sequence of data collection normally started with the data on managerial level, at which time the name lists for the individuals were obtained. The data for the individual level (per manager) was only collected after the manager's interview, and this data collection normally ran in parallel with all the interviews held for the case, and even for some weeks after the interviews had been completed, to allow sufficient time for individuals to participate.

To facilitate the descriptive statistical analysis of the data, various question constructs were included. In the questionnaire, *radio buttons* indicated single choice, *multiple-choice tick-boxes* indicated that more than one answer could be selected without ranking or rating required. The multiple-choice and single-choice options were created as nominal or categorical data, which could be analysed through cross-tabulation tables such as those described by Zikmund (2003:521). In addition, pie

charts were created for single-choice options, to show the percentage distribution of the categories in the data set, while various column charts were used to visually represent the analysis of multiple-choice questions, in some cases sorted in descending frequency of selection. The 5-point *Likert scale was* included for opinion-type questions (Saunders *et al*., 2009:378), with ratings ranging from "Strongly disagree" and "Disagree" to "Agree" and "Strongly Agree". A neutral rating of "Neither disagree or agree" was also added to complete the mid-point of the scale. The ordinal data in the Likert scale questions was averaged on the first level of analysis. That is, descriptive statistics were applied to all these questions (mean, mode, average, standard deviation), and counts were completed for each rating selected, so that the percentage "agree vs. disagree" could be calculated for each respective data set. *Free format (n/t)* indicated either **n**umerical or **t**ext entries that could be made. The entries for numerical data were limited, and options were rather presented as categorical data (such as age in years), while free-format text entries were added as "Other" in multiple-choice questions, as well as a limited number of open-ended questions to allow for some flexibility in answers on the individual level.

The questionnaires were created in an online survey tool called Lime, which allowed for the answers to be captured online, instead of on paper. The answers could also be exported from Lime directly into a spreadsheet on closing the survey. A separate but identical survey was created per team, so that the individual team members' answers could be analysed in relation to the specific manager. Although the questionnaire was closed and tokens were generated for each individual email address, the questionnaire was anonymous and no information regarding the token or individual was saved with the responses.

Lime also facilitated the process of sending reminders to those individuals who had not yet responded. This was possible because tokens had been created per individual, and it was normally done 10–14 days after the initial invitation had been sent out, and then again 14 days later. A maximum of four reminders was sent, and no specific cut-off date for closure was given. Some of the surveys remained open for four to five months.

An additional, shortened online questionnaire was also given to the manager, which contained a small subset of the individual team member's questions, but rephrased for the manager's point of view. This was used to allow for more accurate statistical comparison of manager and individual team members' perceptions.

One drawback of LIME was that individuals were not able to save and continue with questionnaires later, even though it was a function purported to exist in the tool. Three individuals contacted the researcher in this regard, and requested assistance with completing the survey. In two cases it was possible to extract the data already filled in, and have the individual complete the last answers on a spreadsheet. In the other case the individual needed to start over again, and the duplicate record was deleted. Another drawback of LIME was that some duplicate entries were created in the process of sending reminders. This seemed to have happened when the individual had completed the entry using the first link, and the tool generated a new link and token for the same individual when the reminders were sent. It was possible to identify those entries and remove the duplicate. The first entry of the individual was deemed to be the correct one and was kept, while the second entry was deleted.

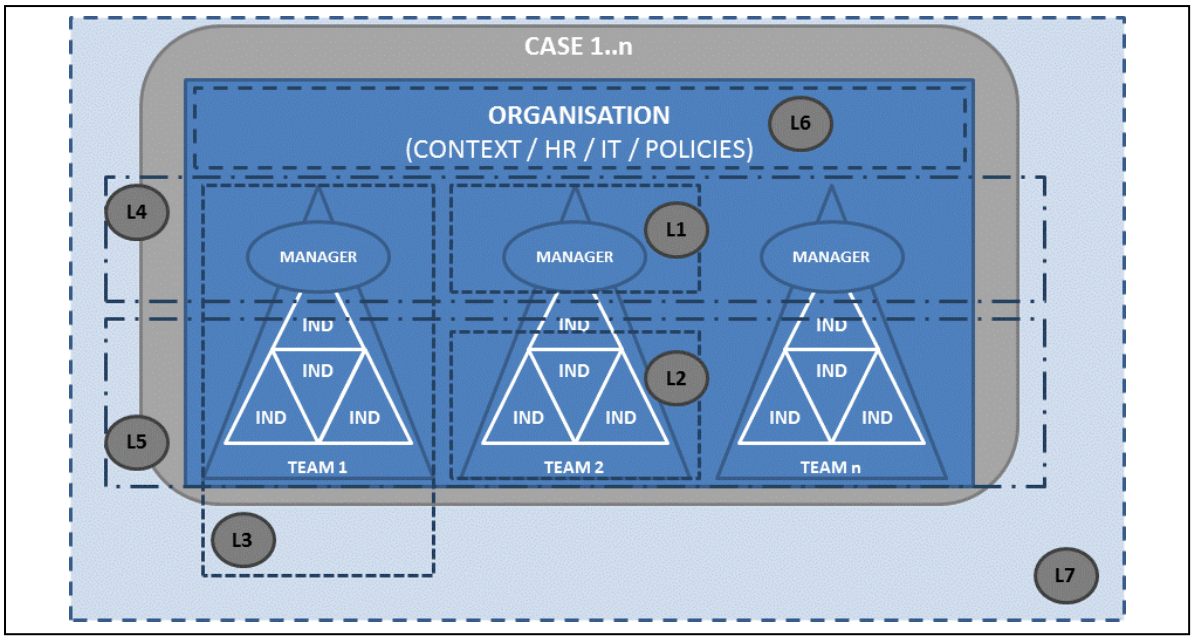
The introductory emails, full questionnaires, and reminder emails can be found in Appendix C – Online Questionnaires for both the individual team member and the managers.

4.5 DATA ANALYSIS

4.5.1 Levels and Sequence of Analysis

Although data was only collected on three levels, namely at manager, individual team member and organisational level, seven embedded units of analysis were identified for the data. Each unit of analysis implies a specific analysis method to be followed, and a specific extent of mixing of the qualitative and quantitative methods. These levels, linked to the units of analysis, are shown in Figure 4-4.

Figure 4-4: Levels of analysis



As confirmation of the terminology used in this document, L7 is the case, in other words a summary of findings relating to the company as a whole. The word “team” (L3) refers to the combination of the manager and the individual team members, while organisational level (L6) is represented by the HR and IT representatives, as well as the policies and other documents. The other levels of analysis, together with the analysis methods, are listed in Table 4-1. Where more than one method is listed, it shows the mixing between the qualitative and quantitative methods.

Table 4-1: Levels of analysis per case

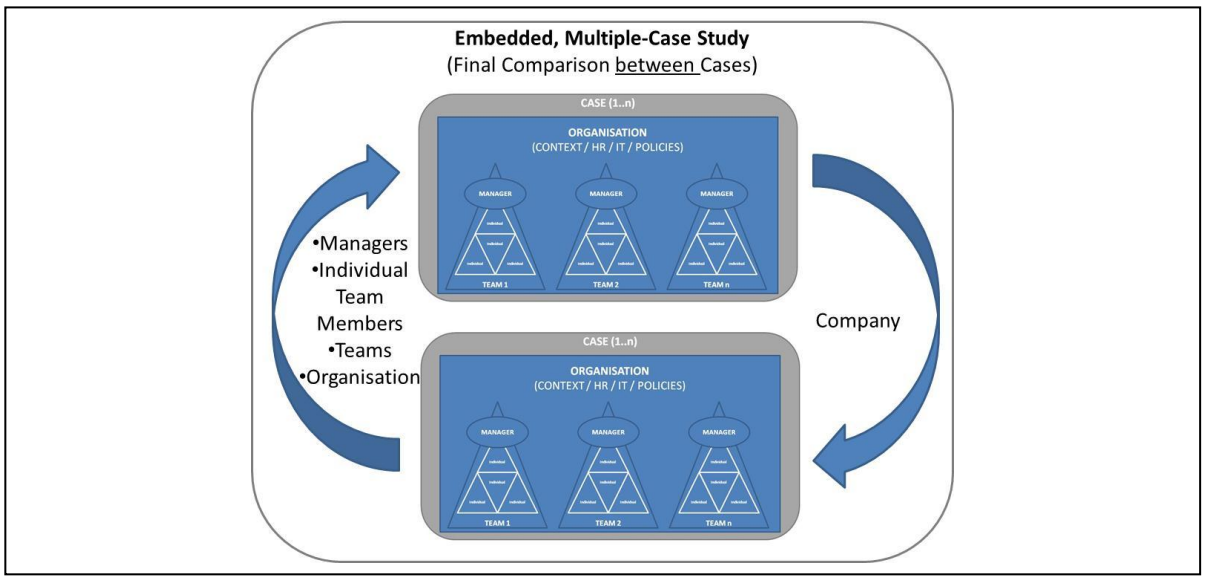
Level	Level Description	Analysis Method	Analysis and Mixing Notes
L1	Manager of Team	Open Coding	Qualitative analysis of semi-structured interview through constructivist grounded theory process. (ATLAS.ti)
L2	Individuals in team	Descriptive statistics	Describing the specific team members by combining all responses of individual team members in one dataset. (Excel)
		Open Coding	Qualitative methods used for answers to open-ended questions. (ATLAS.ti)
L3	The team	Relating L1 and L2 data to each other. Triangulation	Using visual inspection to link what managers mentioned in the interviews with the questionnaire answers. (Word)

Table 4-1: Levels of analysis per case (Continued)

Level	Level Description	Analysis Method	Analysis and Mixing Notes
L3	The team (cont.)	Descriptive statistics	Comparing manager answers to questionnaires with related questions answered by individuals in one dataset (Excel)
L4	All managers combined	Axial coding	Making sense of the codes; pictures to show categorisations (ATLAS.ti networks and Word) All managers for the case in one dataset (ATLAS.ti)
L5	All teams combined	Descriptive statistics	Creating one dataset of the questionnaire responses for the company to obtain organisational view. (Excel)
L6	Organisation	Open Coding	Descriptions of the company and feedback from HR and IT representatives (ATLAS.ti)
		Triangulation	Comparison with answers of managers.
		Descriptive statistics	Comparison with answers of individuals.
L7	Case	Selective coding Descriptive statistics	Merging of the findings for the company. (Word) All interviews in one dataset. (ATLAS.ti) All individual and manager questionnaires in one dataset (Excel)

The analysis of each case, where the data obtained per company were analysed and documented, uses all of these levels of analysis to describe the case. The final level of analysis is where the cross-case analysis and data synthesis takes place, as shown in Figure 4-5. This cross-case analysis is described in the main document in Chapter 5.

Figure 4-5: Cross-case analysis



4.5.2 Data Analysis for Interviews

4.5.2.1 Coding of the interviews

As part of the qualitative research approach followed for this study, analysis methods relating to the constructivist grounded theory were employed for the textual data. To this end, the data analysis of the interviews was done through a process of comparative coding of the interview transcripts. Coding, as described by Goulding (2002:77), is “the conceptualisation of data by the constant comparison of incident with incident, and incident with concept, in order to develop categories and their properties”. A process is normally followed whereby the coding moves through different and ever greater levels of abstraction to arrive at the underlying theoretical framework.

In a study where pure grounded theory is used, the researcher normally starts with a “clean slate”. In other words, starting with no codes at all, and then identifying initial concepts from the transcripts through a process of open coding, in which concepts are identified in words, phrases or sentences (Burden & Roodt, 2007:15; Goulding, 2002:170; Smith, 2004:27). Since in this study an initial literature review was performed to create a framework of questions, a basic list of codes was created based on the concepts covered in the questionnaire components and questions that

were asked in the interviews. This formed a descriptive framework (Yin, 2009:162) as starting point for the open coding.

The next step after open coding is to identify a set of broad categories that are compared with one another to determine links between ideas as well as sub-categories (Burden & Roodt, 2007:15; Mills *et al.*, 2006:5). This step is call *axial coding.* From there, the researcher can move to *selective coding,* which is an abstract level of analysis. The conditional or *consequential matrix* is also mentioned as an additional analysis tool in the coding phase (Goulding, 2002:87; Mills *et al.*, 2006:5). The final step of coding is where the *core categories* are identified. How these steps were executed for this study is now explained.

A single hermeneutic unit was created in ATLAS.ti for the coding analysis in this study, into which the basic framework of codes was loaded (refer Appendix E – Initial Code Lists and Network Diagrams). This was used in the pilot study to code all the interviews of the managers, as well as the IT and HR interviews. The codes covered basic concepts such as “HR Policies”, “IT Policies”, “Management: Approach”, “Organisational Support”, “Performance: Handling non-performance”, “Performance: Specific Deliverables”, “Performance: Metrics”, “Performance: Quality”, “Selection” and “Team Composition”. During coding of the first set of transcripts, there were already new codes added that did not necessarily fit in with the initial conceptual framework. These were initially marked as “NEW”, but re-coded for the subsequent cases to become part of the full coding structure.

Quotations that were linked to the codes were initially selected on the basis of a single word, a sentence or a whole paragraph. It was found that selecting more of the paragraph was better in order to contextualise what was said, especially when viewing the quotation in isolation from the full text. Selecting whole sentences or paragraphs also assisted in the correct identification of co-occurring codes through ATLAS.ti’s analytical and reporting functions.

As new transcripts were added, the method of constant comparative coding was used (Gibbs, 2007:50; Goulding, 2002:77); in other words, each new transcript and piece of text was compared with the codes, and with other pieces of text that were

coded in the same way. To this end, the code-comment function of ATLAS.ti was supportive, in that each time a new code was created, the reason for using the code and type of concepts to be linked with the code could be added to the code comment. The interviews in the pilot study were used to evolve a more complete coding structure for the research. In terms of the coding structure that evolved, there were certain principles followed: for *selecting the words* for the codes; the *full naming convention* used; and following an *iterative process* of higher and lower levels of abstraction for codes. These principles are now discussed in more detail.

For the first principle, relating to the selection of the words to use for a code, Gibbs (2007:44) indicates three possibilities, namely descriptive codes, which simply use one or more of the words that were used in the text; code categories, which start grouping the quotations into concepts; and analytical codes, which already start identifying some underlying reason. A combination of descriptive and category-type codes were used for the phase of open coding. An example of a descriptive code in the context of a specific deliverable would be “Report”, while a category-type code in the context of metrics would be “Yes-No”.

Secondly, the naming convention used not only the word or category as part of the code, but also prefixed it with a “grouping” code, as proposed by Archer (2012:25). Examples include “Performance: Specific Deliverable: Report”, “Performance: Specific Deliverable: Timesheet”, “Performance: Metric: Yes-No”, “IT Technology: Communication”. The full list of codes is available in Appendix E – Initial Code Lists and Network Diagrams. This facilitated working with the codes in ATLAS.ti from a practical perspective in terms of sorting and finding codes, but also from a first level of abstraction (axial coding) which was integral to the naming convention, rather than using the family or super-code structure also provided by ATLAS.ti for this purpose. The disadvantage was that a total code list of more than 700 codes was created.

In terms of the iterative principle followed in the third principle mentioned, the coding started with the initial framework on a category level, such a “Performance: Manage Non-Performance” and “Performance: Metrics”. Once this first pass of coding was completed for the interviews of the pilot study, it became apparent, by interrogating the “groundedness” of the codes, that certain codes were over-used. In ATLAS.ti, the

groundedness of a code is automatically calculated and shows how many quotations in the text have been allocated to that particular code. The next step was therefore to create sub-codes to give a better understanding of what was happening in the code. For example, “Performance: Manage Non-Performance” was broken down into its subcomponents, such as “Performance: Manage: Non-Performance: Timing”, “Performance: Manage Non-Performance: Face-to-face”, “Performance: Manage Non-Performance: Get Facts”, and more. As additional cases were added to the hermeneutic unit in ATLAS.ti, additional codes were added that extended the framework, or a finer breakdown of existing codes was done when the groundedness of existing codes became unmanageable (typically above 40).

All of the interviews for each of the cases were first processed (i.e. added to ATLAS.ti and coded in full) before progressing to the next level of abstraction. (The protocol for processing each case and each interview is provided in Appendix D – Case Study Protocol.) In progressing to the next level of abstraction, a network diagram was created for the codes that had already been grouped on the basis of their naming convention, such as “Manage: Performance” on the higher level, and then “Manage: Performance: Specific deliverables” on the next level. In doing so the *axial coding was extended* in showing the relationships between the codes in a diagrammatic form.

An example of a code network is shown in Figure 4-6. This contributed to the “density” of the codes, as automatically calculated by ATLAS.ti for the number of other codes that this code was linked to. As a next step, the codes that had many sub-codes on one diagram or network were then further grouped into higher-level categories or interpretive codes as part of the *selective coding step* in the grounded theory approach. Additional place-holder codes (empty codes showing groundedness of zero but with a high density) were added to the network diagrams for this purpose, and the relevant codes were linked to that code.

Table 4-2 summarises the concepts and steps in the grounded theory approach, and how these were executed in the study, as well as the application of ATLAS.ti for those steps. The families of ATLAS.ti were used more for filtering and sorting than

specifically creating themes, while the facility of super codes was not used at all, but replaced by place-holder codes.

Table 4-2: Execution of grounded theory principles

Grounded theory terminology	Process in study	ATLAS.ti component used
Open coding	Conceptual framework Code types: descriptive and categorical	Code lists and auto-coding Code comments Groundedness of codes
Axial coding	Naming convention Iterative approach high-low-high Linking codes on diagrams (Code networks)	Network diagrams Code densities
Selective coding	Linking codes to place-holder codes Category codes in tables (Code lists and code summaries)	Place-holder codes Extended network diagrams
Themes	Grouping quotes for themes	Memo families Code families
Memoing	Documenting themes Elements per company Manager way of work descriptions Quote comments	Memos
Other	Sorting and filtering	Document families Code families
Other	Further code usage / analysis	Code Co-occurrence Matrix Word count report (Excel) Quotation count report (Excel)

An example of a code network and a code table respectively is provided in Figure 4-6 and Table 4-3.

Figure 4-6: Example: Code network

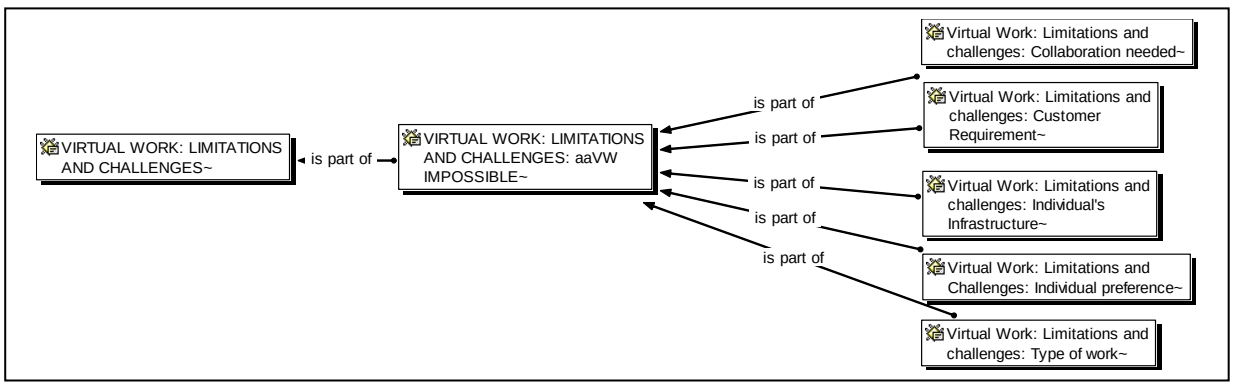


Table 4-3: Example: Code list: Limitations and challenges

Description	Code	Impossible	Possible	Addressed by (Category)
Not feeling part of the organisation	Belongingness {8-2}		X	Manager
Challenges with building and maintaining a relationship.	Building Relationship {11-3}		X	
After-hours work expected Workaholic syndrome	Always online {12-1}		*X*	Individual
Reduced availability when remote	Availability {4-1}		X	
Too much data to transfer	Bandwidth {3-1}		X	Organisation
Corporate culture not supportive of remote workers.	Corporate Culture {2-1}		X	
Combined problem solving, design or development needed.	Collaboration needed {19-1}	*X*		Impossible
Preference of individual not to work virtually.	Individual preference {5-1}	X		

The numbers in brackets as part of the code will be described in more detail in the next section.

4.5.2.2 Analysis techniques: Groundedness and density

Various analysis techniques available in ATLAS.ti were used to analyse the codes in order to move through the different levels of abstraction, or from open coding and axial coding to selective coding. These are listed in Table 4-2 and are described in more detail below.

The first element used to review the code was the groundedness and density of the code, which are both calculated automatically in ATLAS.ti. The groundedness of a code shows how many quotations in the text have been allocated to that particular code, while the density of a code represents the number of other codes that this code is linked to.

When codes are shown in the tables in Chapter 5, the numbers in brackets {x-y} indicate the approximate groundedness (x) and density (y) of the code. The reason why these are described as “approximate” is that some of the codes were still changing as the document evolved, which implies that the numbers in the document may differ from what the final and actual number in ATLAS.ti would be. Where there is a difference between the document and the final ATLAS.ti web site created as part of the supplemental documentation, ATLAS.ti will have the correct number.

In addition, using quantitative techniques to describe qualitative data is not seen as advisable (Pratt, 2009:857), therefore the groundedness numbers were not used as absolute numbers, but where the groundedness was especially high in relation to the other codes for a specific area of analysis, this indicated a leaning towards the concept that the specific code represented. For example, in Table 4-3, it is clear that in terms of the sub-codes created for the code “Virtual work: Limitations and challenges”, the challenge “Collaboration needed {19-1}” was much more pertinent than “Availability {4-1}”. This can be seen from the fact that the groundedness of the first code was 19 and the groundedness of the second code was only 4. By looking at the codes with higher groundedness, or where the groundedness of one code differs significantly from the code with the next-highest groundedness, the chances of a theme emerging with that code is very high. Techniques used to verify the authenticity of the groundedness included reviewing the quotes again, splitting codes into lower-level sub-codes and cross-checking the use of the code across cases with the quote count report provided by ATLAS.ti.

The density of a code was automatically increased as network diagrams were built. The network diagrams were used to group the codes into additional code categories and analytical groups. On the selective coding level, a code with zero groundedness and a high density shows that this is a core category code. If codes have both a high groundedness and a high density, it implies that they are important in identifying the final themes.

4.5.2.3 Analysis techniques: Co-occurrence tables

In some cases it was decided not to split the code into lower-level sub-codes. This was done where a full set of other codes already existed, such as for the co-occurrence of "Selection: Manager Criteria" and "Performance: Individual Characteristics". ATLAS.ti would produce a matrix in Excel, and where the intersection cell in the table had a value (called the coefficient value), it showed that both the manager criteria and the individual characteristics codes were applied to the same quote (Table 5-28). By interrogating the co-occurrence table, the specific characteristics that a manager would use for selection could thus be found. The magnitude of the value, which was between 0 and 1, also showed the intensity of the match. The higher the value, the more intense was the match or co-occurrence. The calculation for the coefficient is given as "[n12/((n1 + n2) – n12)] where n12 is the co-occurrence frequency of two codes c1 and c2, n1 and n2 being their individual occurrence frequencies" (Garcia, 2005). An example of a calculation is shown below.

N1 = 51 for C1 "Selection: Manager Criteria"
N2 = 13 for C2 "Performance: Individual Characteristics: Maturity: Seniority"
N12 = 4
C = N12 / ((n1+n2) –n12) = 4 / ((51+13) – 4) = 4/60 = 0.06667 = 0.07

Garcia (2005) also indicates that the calculations may produce faulty values where overlaps of quotations for the different codes are not absolute, or where a low coefficient might not represent the importance of the number of overlaps sufficiently. Therefore, the numbers (and any subsequent column totals) have not been used as absolute values with the aim of quantitative comparisons, but rather just to give an indication of the prevalence of the co-occurrence in relation to other code co-occurrences for the specific selection.

4.5.2.4 Analysis techniques: Other counts

Two other analysis techniques in ATLAS.ti were used regarding counts of concepts during the analysis phase and as described in Chapter 5. The one feature is a word-count report that ATLAS.ti provides which can be exported to Excel. The word-count report was created after all the interviews with managers, HR and IT representatives

had been imported, as well as the answers that individuals gave to the open-ended questions in the online questionnaires. The word-count report does not depend on any codes, and simply counts each and every word used in the hermeneutic unit. An extract from the word-count table is given in Table 4-4. The numbers at the top (P2, etc.) indicate the different document instances. The total in the last column would be the total for that word across all the documents loaded in the hermeneutic unit. Where the count is higher, it could indicate a preference for a word that could lead to a theme. This analysis technique was used in analysing the usage of "control"-type words as shown in Figure 5-20 in Chapter 5.

Table 4-4: Word count extract example

Words	P 2	P 4	P 5	Pxxx	P 55	P 56	Total
STANDARD	7	5	4	xx	3	0	91
STANDARDISATION	0	0	0	xx	0	0	1
STANDARDISE	1	0	0	xx	0	0	6
STANDARDISED	0	0	0	xx	0	0	2
STANDARDS	2	0	2	xx	0	0	21
TRUST	1	0	0	xx	2	0	118
TRUSTED	0	0	0	xx	0	0	7
TRUSTING	0	0	0	xx	0	0	5
TRUSTS	0	0	0	xx	0	0	1
TRUSTWORTHY	0	0	0	xx	0	0	2

The quotation count matrix was used to give a view of the spread of code usage across the different companies and interviews, and as a check to determine whether codes were allocated reliably across the cases. In Chapter 5, the quote count was only represented in terms of the groundedness numbers. The full code list and quote count table can be found in the supplementary documentation. An example of a few rows from this table is provided in Table 4-5.

Table 4-5: Quote count extract example for "Virtual work reason"

Code	Alpha	Echo	Foxtrot	Tango	Delta	Total
Individual: Benefit/privilege	7	5	5	9	2	28
Customer: Geography	4	0	9	5	0	18
Organisation: Cost Saving	4	1	1	3	0	9
Organisation: Company Structure	0	0	5	0	3	8

Table 4-5: Quote count extract example for "Virtual work reason" (Continued)

Code	Alpha	Echo	Foxtrot	Tango	Delta	Total
Work Type: Projects	4	1	0	2	1	8
Customer: Working day	1	5	0	0	0	6
Work Type: General	2	0	2	1	1	6
Customer: Time Zones	0	1	3	1	0	5

4.5.3 Data Analysis for Questionnaires

Quantitative principles were used for the analysis of the responses received via the online questionnaires. The first step was to close each questionnaire and download the data in a comma-delimited format that could be opened in Excel. Then the data was consolidated into a single dataset for each case, where clean-up of the data was performed, and additional calculated fields added. Lastly, each question or set of questions was analysed to produce the relevant graphs or percentages. These case datasets were used to do the L3 (team) and L5 (cross- team) analysis and comparisons.

4.5.3.1 Closing and downloading the responses

The Lime online survey tool provides a mechanism whereby the response data can be downloaded to an Excel spreadsheet. Each individual questionnaire (per team per company) was exported to its own spreadsheet in both a full descriptive and an abbreviated format. The full descriptive format would contain the full questions and the full words per question, such as the word "Yes", "No" or "Uncertain" for a question such as "Are you a virtual worker?" In the abbreviated format, Lime had automatically substituted numerical codes for all words, as shown in Table 4-6. In addition, in questions where the individuals could select multiple answers from a list, all items marked (or selected) would be coded with "1" and all those not selected would be coded with "0".

Table 4-6: Question category coding

Type	Yes / No	Likert	Satisfaction
Coding	0 = No 1 = Yes 2 = Uncertain	1 = Strongly Disagree 2 = Disagree 3 = Neither disagree or agree 4 = Agree 5 = Strongly Agree	1 = Extremely dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Extremely Satisfied

4.5.3.2 Data consolidation and cleansing

Once all of the data per team had been exported, the responses of each team were copied into one single Excel spreadsheet or dataset per company. The first step was to review the entries for completeness. Those entries that were marked by Lime as incomplete, but had only missed the open-ended answers, were kept as “complete”. Those responses in which more than half of the questions had been answered were also kept, since comparisons could still be done on the remaining fields. There were four responses in this category. Percentages per question were always calculated based on the number of responses for that question and not the total number of responses. The other incomplete entries were deleted from the dataset. A total of 163 entries were kept for analysis.

The next step was to add various calculated fields in the data. The letter and number (D2) in Table 4-7 indicates the question code in the spreadsheet. The next column shows how the new value is calculated and the last column gives an example. The purpose of the calculated fields was to add more detail around virtual work.

Table 4-7: Calculated columns

Input Field (s)	Calculation	Example values
D2[1] –Years employed D2[2] – Months employed	D2[1+2] Total months = D2[1] * 12 + D2[2]	1 year and 2 months = 14 months
D5 – Days away from manager	D5 Convert hours to days D5 / 8	40 hours = 5 days
D5 – Days away from manager	D5-1 Virtual worker = IF D5>1 Then "YES”, Else “NO"	1 day away from manager = NO 2 days away from manager = YES

Table 4-7: Calculated columns (Continued)

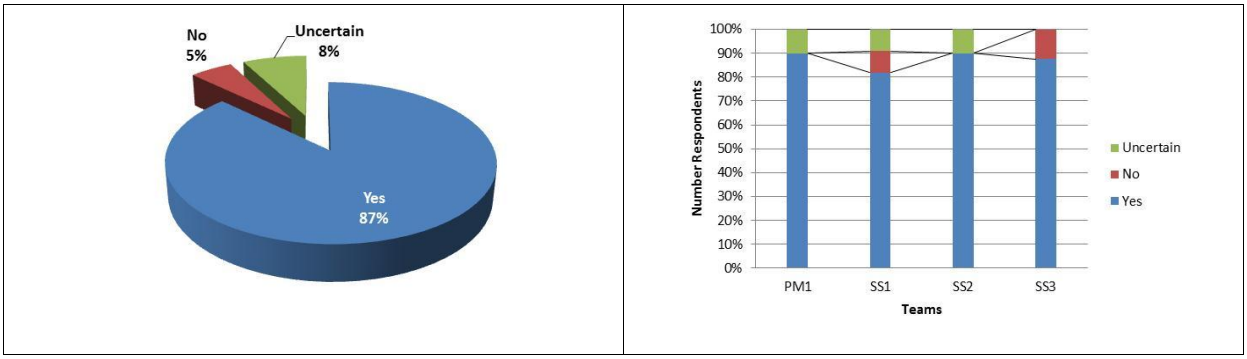
Input Field (s)	Calculation	Example values
D5-1 Virtual worker Yes/No D7 – Location were most work performed when away from manager	D7+D5 Away from manager and location combined IF D5-1 = "YES" THEN IF D7 = "Home" THEN IF D5>4 THEN “Home worker” ELSE “House” ELSE D7 ELSE "Traditional"	Virtual worker = YES Location <> Home = Location where most work performed
D5-1 Virtual worker D10 – Virtual work perception	D10-1 IF D5-1 = "YES" THEN IF D10="Yes" THEN "Similar-Virtual" ELSE "Calc-Virtual" ELSE IF D10 = "No" THEN "Similar-Non" ELSE "Calc-Non"	Virtual worker = YES Virtual work perception = NO = Calc-Virtual
D11[1] –Years as virtual worker D11[2] – Months as virtual worker	D11[1+2] Total months = D11[1] * 12 + D11[2]	1 year and 10 months = 22 months

In addition to the responses from the individuals, the responses for all the managers were also copied into the dataset of the case. The response of a manager could be linked to the specific team because the manager responses were not anonymous. Similar clean-up and calculated fields were added. In addition, the questions of the managers were mapped to those of the individuals so that the respective answers could be compared from both an individual and a manager’s perspective.

4.5.3.3 Data analysis and graphing

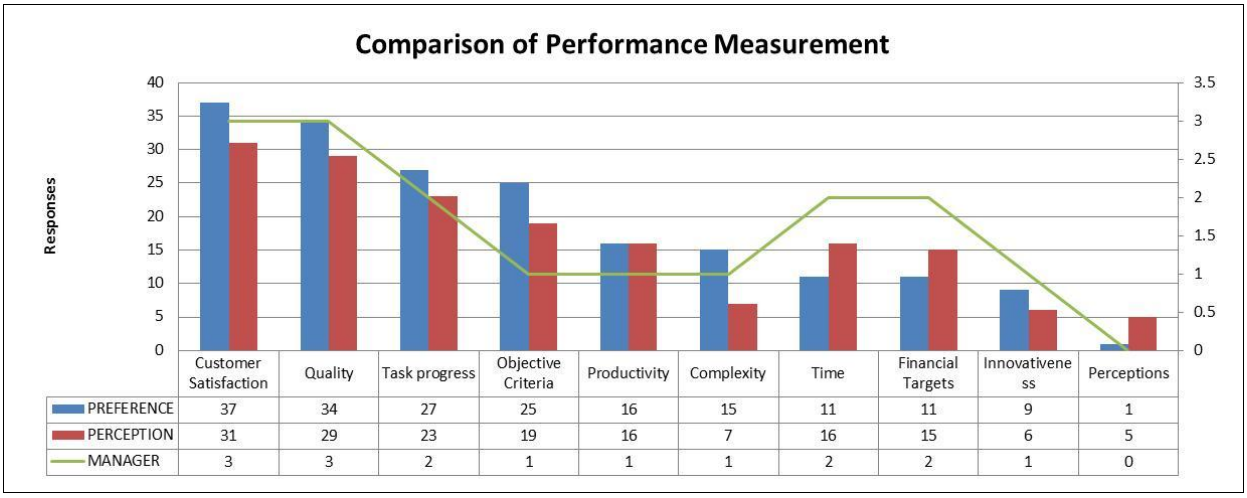
Each question or related set of questions was now analysed in a separate sheet in the workbook. Descriptive statistics were used. For simple categories that were analysed on L5 (i.e. all individuals of the case dataset combined), a pie chart was used to show the percentages of a category in relation to the total dataset. An example is shown in the left-hand side of Figure 4-7. Where teams or business units were compared, a “100% stacked column” chart was used as shown in the right-hand side of Figure 4-7.

Figure 4-7: Example graphs on case level (L3/L5)



Where comparative questions were asked, such as question MP3 and MP3b, as shown in , the number of times the option was chosen for the total dataset was counted for both the perception and preference questions. The answers per category were then sorted in order of descending preference, and displayed on a clustered column chart. The managers' answers were then counted and mapped on the same chart, but on a secondary axis. By using the secondary axis on the graph, the managers' responses, which were obviously much fewer than the responses of the individuals, were plotted in relation to the scale of the individuals. The example is shown in Figure 4-8. The abbreviations used for the graphs in relation to questions MP3 and PM4 are shown respectively in Table 4-8 and Table 4-9.

Figure 4-8: Example clustered column chart



	Customer Satisfaction	Quality	Task progress	Objective Criteria	Productivity	Complexity	Time	Financial Targets	Innovativeness	Perceptions
PREFERENCE	37	34	27	25	16	15	11	11	9	1
PERCEPTION	31	29	23	19	16	7	16	15	6	5
MANAGER	3	3	2	1	1	1	2	2	1	0

Table 4-8: Question to graph abbreviation mapping (MP3)

Question code	MP3 How is your performance measured? MP3b How would you like your performance to be measured?	Graph abbreviation
MP3(b) [1]	Time spent working	Time
MP3(b) [2]	Number of products produced/delivered in given time	Productivity
MP3(b) [3]	Quality of work produced	Quality
MP3(b) [4]	Level of customer satisfaction	Customer Satisfaction
MP3(b) [5]	Management perceptions only	Perceptions
MP3(b) [6]	Meeting financial targets	Financial Targets
MP3(b) [7]	Meeting objective criteria	Objective Criteria
MP3(b) [8]	Progress on allocated tasks	Task progress
MP3(b) [9]	Novelty of solutions produced	Innovativeness
MP3(b) [10]	Complexity of solution produced	Complexity

Table 4-9: Question to graph abbreviation mapping (MP4)

Question code	MP4 How is your attendance measured or checked? MP4b How would you like your attendance to measured or checked?	Graph abbreviation
MP4(b) [1]	Agreed start and end times	Start & End
MP4(b) [2]	Agreed total number of hours per day	Hours / Day
MP4(b) [3]	Presence Tool	Presence Tool
MP4(b) [4]	Shared Calendar	Shared Calendar
MP4(b) [5]	Workflow in emails	Email Flow
MP4(b) [6]	Online availability	Available online
MP4(b) [7]	Not measured or checked explicitly (based on trust)	Trust

For questions that used a Likert scale, such as “There are objective criteria whereby my performance can be measured”, a percentage was calculated for the “Agree”, combining “Strongly agree” and “Agree”, vs. “Disagree”, combining “Strongly disagree” and “Disagree” vs. “Neither disagree or agree”. An example is shown in Table 4-10. The rounded percentages were transferred to the case description document.

Table 4-10: Calculations for Likert questions

Statistical measure	Calculated value	Percentage of total
Median	4	
Mode	4	
Variance	0.69	

Table 4-10: Calculations for Likert questions (Continued)

Statistical measure	Calculated value	Percentage of total
Standard Deviation	0.83	
Strongly Disagree	Count If 1 = 1	2.6%
Disagree	Count If 2 = 1	2.6%
Neither	Count If 3 = 6	15.4%
Agree	Count If 4 = 23	59.0%
Strongly Agree	Count If 5 = 8	20.5%
TOTAL	**39**	**100%**
Total Agree		**79.5%**

4.5.3.4 Company comparison

After all of the cases had been analysed and documented separately, a single dataset was created in Excel which combined all the responses of the individuals and separately all the responses of the managers. Each response was still marked with the original company, team, business unit and version of the questionnaire used.

Two main types of analysis were done: those related to general categories or yes/no questions, and those that related to Likert-type questions. On the cross-case level, both of these types of questions were analysed in the same way. The totals per category were copied from the company's data sheet into a summary sheet as shown in Table 4-11.

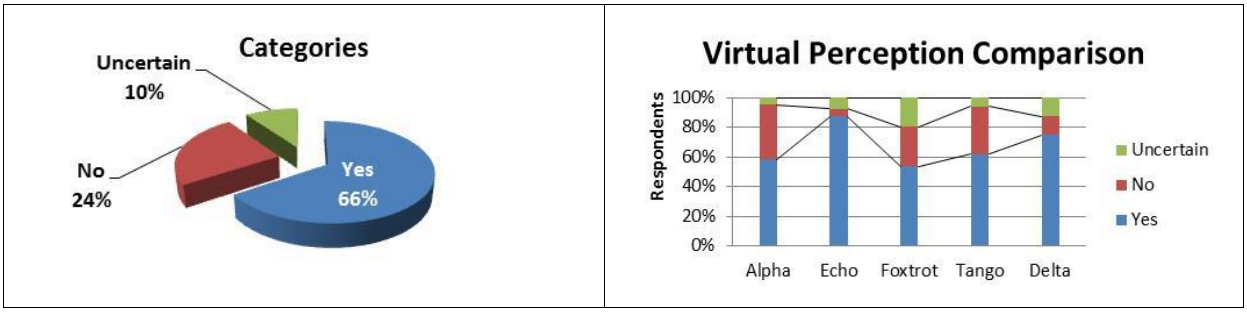
Table 4-11: Response counts for virtual status perception

	C1	*C2*	*C3*	*C4*	
		Categories			
	Company	**Yes**	**No**	**Uncertain**	**Check sum**
R1	Alpha	24	15	2	**41**
R2	Echo	34	2	3	**39**
R3	Foxtrot	22	11	8	**41**
R4	Tango	21	11	2	**34**
R5	Delta	6	1	1	**8**
R6	**TOTAL**	**107**	**40**	**16**	**163**

The totals for each category column (R6 for C2, C3 and C4) were used to create a pie chart that showed the percentage split per category for the total group of

respondents across the cases (163 in total). This is shown in the left-hand side of Figure 4-9. Then a comparative column chart was created using a "100% stacked column" format, where each company is represented in its own column, with the categories making up the different parts of the stack. This was done so that the magnitude (or percentage) of the responses per category for a company could be shown relative to the percentage for that category in the other companies. The company comparisons are shown in Chapter 5, while the actual percentages per company per category are available in the respective case descriptions in the supplementary documentation.

Figure 4-9: Virtual status perception graph example



4.6 DOCUMENTING THE WITHIN-CASE AND CROSS-CASE ANALYSIS

4.6.1 Purpose of the Supplementary Case Document

The purpose of the supplementary case document was to provide a comprehensive analysis of each company, since a decision was made to document only the combined and cross-case themes in the main document as part of a cross-case analysis and data synthesis approach (Yin, 2009:156). This is a decision which is relevant to multiple-case studies and is one of the approaches that can be used to document the study (Yin, 2009:175)

While analysing and documenting each case, the researcher had already highlighted elements contributing to the cross-case themes and the final framework and included them in the case description. This acted as a conceptual worksheet for the multiple-case review, as described by Stake (2006:49). These elements were integrated into

the cross-case analysis of Chapter 5 and the data interpretation as provided in Chapter 6 of the main document.

Each individual case description is divided into four main sections, namely organisational description, team demographics, management of performance and parameters affecting performance. These sections have been used to answer Research Objective 1, "How is performance of virtual knowledge workers managed?", and Research Objective 2, "What parameters affect performance of virtual knowledge workers?". The organisational description, management of performance and parameters affecting performance sections have been transferred to the main document as part of the cross-case analysis in Chapter 5.

4.6.2 Using Quotes to Confirm Analysis

In both the within-case analysis and cross-case analysis, selected quotations are used to substantiate the statements made and the coding used. To enable cross-referencing with the original transcript, the primary document number and its paragraph number are linked to each quote. This is represented by, for example, "P8 (250)" which indicates that the quote was obtained from primary document 8, paragraph 250. The specific company pseudonym is not necessarily included; this is to maintain a certain level of anonymity. It is especially omitted where quotes are representative of the study as a whole. Where quotes are specific to a company, the case pseudonym will be stated in the preceding text. In addition, where a set of codes are described in a preceding paragraph, the quotes representing the different codes will be grouped together in one quote block, but the different types of quotes will be separated by quote headings given in bold (e.g. "Training not needed"/"Training needed" as shown below). Answers provided by individuals as part of the open-ended questions in the online questionnaires will also be marked by a similar quote heading ("Individual confirmation in open-ended questions")

An example of a list of quotations is given below, showing the notations used.

> **Training not needed:**
> "I've never trained any of my guys on stuff like that. And I think my expectation is that if

you're in the Software Support business scene you should have an understanding of the new technologies coming out." P8 (250)

Training needed:

"I only just discovered OCM <*Office Communicator*> myself last year for the first time when I attended a company meeting here in Johannesburg and the guy said, "Listen, are you on OCM?" I said, "OC what?" And then I discovered OCM." P5 (272)

Individual confirmation in open ended questions:

"People in the organisation need to be trained to understand the concepts of working from home and giving people accountability for deliverables, rather than micro-managing people." P57 (42).

4.6.3 Describing The Organisational Level (L6)

This section describes the organisational level of each company in more detail and represents level 6 of the analysis. Information obtained through the HR and IT representatives' interviews as coded in ATLAS.ti, as well as information available from the policies, is pertinent to this level. The perceptions of managers regarding performance management, virtual policies and HR and IT support are also compared in this section, as obtained from the open coding of the interviews. In addition, relevant descriptive statistics from the individuals' questionnaires are included to describe the organisational level. These include questions such as "Does the organisational culture support virtual work?" and "Does the technology provided on organisational level support virtual knowledge workers?"

4.6.4 Describing the Teams (L3/L5)

The team is the combination of the manager and the individuals reporting to the manager. In terms of response analysis, where multiple discrete teams were included for one area of the company, the teams were combined in their functional areas to represent the different "business units". When results in the supplementary documentation and Chapter 5 refer to team results (as in "team level" of analysis or L3 and L4 analysis), the results will include all the teams in that functional area, rather than results per discrete team. So all the individual responses from the team members are copied into one dataset, but still categorised per team and per business unit. The aim of the descriptive statistics in this section is to give a view of the demographics of the individuals in the teams, and to establish their status as virtual knowledge workers.

For the L3 description of the team, inputs from the manager interviews were used to describe the teams in terms of key deliverables, way of work and location. As indicated, this is normally done as a combination of teams into a business unit, rather than for discrete teams. In the same way, for the L1 unit of analysis, the manager was never really described as an individual, but rather on L4, as part of the views of all the managers in the company, or as part of all the managers for a business unit, which is a combination of teams.

This section ("Describing the Teams") was only included for the individual case descriptions in the supplementary documentation.

4.6.5 Describing the Virtual Work Context

It was important to first describe the virtual work reasons, advantages, limitations and challenges, before further analysing how performance was being managed. This created the context in which the management of performance of virtual workers was taking place. One of the elements that was important in this context was the virtual status of the individuals participating in the study. The "virtuality" (or virtual status) of participants was calculated based on the number of days they spent away from their manager. If they spent more than one day away from their manager, the virtual status of "YES" was given, in other words they were deemed to be "removed from the direct sphere of influence of management and co-workers." (Jackson *et al*., 2006:219).

4.6.6 Describing the Management of Performance (L3/L4/L5)

The purpose of this section is to analyse how managers are managing the performance of their virtual knowledge workers. To achieve this, the data gathered on the management level was combined (L4) through additional axial coding, and similarities and differences between the respective teams and business units were determined (L3) at within-case analysis level, and similarities and differences between cases were determined at cross-case analysis level. At the same time, the questions asked in the online questionnaires were consolidated in one dataset (L5),

grouped per business unit/team and later case, and the resulting graphs were correlated with the relevant qualitative data, supporting the principles of triangulation.

4.6.7 Parameters Affecting Performance (RO2)

Three different levels of influence are documented. The first is from organisational level to teams (RO2a). The data from the interviews, as one dataset, was used to determine these impacts through open coding and axial coding.

The second level of influence is from the managers to their team members (RO2b). This could be as a result of the kind of persons the managers are, their approach to management, their assumptions regarding remote work, and the way they manage non-performance. These possibilities have been coded through open coding and axial coding.

The third level of influence is from the individuals' side (RO2c). The data used for this comes from the interview data from the managers and from the answers provided in the open-ended questions asked in the online questionnaires.

4.7 SUMMARY

In the execution of this embedded, multiple-case study research, a protocol was created and used for the collection and analysis of data. The interview component of the protocol included email examples, template letters, interview schedules, semi-structured question guides and field-notes templates. These were all copied into a directory structure and replicated per case. Additional email templates were created in LIME, which assisted in the administration of the online questionnaires. A separate questionnaire was sent to each team. The analysis component of the protocol included procedures and steps to follow for processing (or coding) of each transcript, as well as how to use the memos for capturing additional notes, and initial steps in coding. The pilot study in Alpha was used to refine the protocol and questionnaires.

The ATLAS.ti tool was used to process and code the transcripts. The coding started at open coding and progressed through various levels of abstraction to achieve axial and selective coding. This was done using a specific naming convention in the codes that included the broader categories, and linking codes on network diagrams, as well as adding place-holder (selective coding) codes to group lower-level concepts together. The reporting and analysis functions of ATLAS.ti were also used extensively to review and analyse the data. Analysis was done on L1 (manager level) and L4 (combined managers for a business unit or for the company as a whole). The answers to the open-ended questions of the individuals' questionnaires were also imported as documents per team into ATLAS.ti. This assisted in correlating the information from the team with that from the manager as part of L3 and L5 of analysis.

For the analysis of the online questionnaires, the data was downloaded into spreadsheets per team, after which the teams were combined in one dataset for the company, which represented L5 of analysis. The managers' online questionnaire responses were also added to the same spreadsheet, representing L4 of analysis, and enabling L3 analysis, where teams or business units were compared with one another. Various descriptive methods were used to analyse the data, including pie charts, 100% stacked columns, clustered column charts and percentages for "agree vs. disagree" on Likert-scale questions. All the individual responses and manager responses were combined into one dataset for the final company comparison.

As part of the write-up of the multiple-case study, it was decided that the main document would only be used to document the cross-case analysis and synthesis. Each case was therefore documented as a separate supplementary document, and contained the analytical description of the case from an organisational, team and manager point of view. This description covered Research Objective 1: to investigate how performance of virtual workers is being managed. The parameters affecting performance were also described, and covered Research Objective 2: to describe which parameters affect performance. This same structure was also used for Chapter 5, following here, which contains the cross-case analysis and data synthesis for the multiple-case study as a whole.