Chapter 6

Field-test case studies

In the previous chapter the requirements for the design of the protocol were determined based on the findings in chapters 2, 3 and 4. In this chapter the field-test case studies are presented in which the C4 protocol was developed. This development process consisted of the following steps: first a preliminary protocol was designed based on the requirements of chapter 5. The effectiveness of the design was then evaluated and the effects of applying the design analysed. This evaluation led to adjustments and improvements in the design through a process of redesign by adding new requirements. The improved design was then customised and implemented in the next case. Then the cycle started again. As some cases took place at more-or-less the same time, it was not possible to improve the method after each application.

The twenty field-test cases all resulted in lessons learned for the design of the protocol. The learned lessons were continuously used to further improve the first design of the protocol, refining the protocol with each – couple of – cases. During the case studies the adjustments to the protocol became more and more specific, from relatively large adjustments with the first couple of cases to relatively small refinements resulting from the latter cases. The relative surplus value of each individual case decreased from about the 18th case, and therefore the field-test cases were finished after twenty cases. The discussion of the field test case studies starts with the creation of the preliminary design in the first case study. Through an iterative process in nineteen additional cases, this first design ultimately results in the final protocol. The first version of the protocol is described in this chapter. The improved sub-versions of the protocol, which result from the individual cases, are not presented here. Only the specific lessons learned are described. The final protocol will be presented in chapter seven.

The case studies all appeared in the Talent Project that was discussed in chapter four. During the Talent Project from 2003 until 2006 twenty-seven expert-apprentice couples were observed in the development stage of the research. The different projects did not all start at the same time: the projects were spread out over a three-year period. Three expert-apprentice couples did not complete their projects: in two projects the student left the project and in one occasion the expert had personal problems. These couples are included in the data up to the point where they ended the project. Unintentionally, four expert-apprentice couples consisted of two experts instead of one. The apprentices in these cases formed an expert-apprentice relation with two experts, while working on one particular
assignment. In analysing the results of these cases, only those findings are included in which the presence of the second expert was irrelevant. The results that may have been affected by the participation of two experts were excluded from the research.

6.1. Preliminary design of the protocol

The contours of the protocol become visible in the user requirements for the design of an expert-apprentice protocol. The protocol starts with the matching of the expert and apprentice and the checking of the boundary conditions. Then the expert and apprentice in the relation are instructed. During the relation the knowledge sharing between expert and apprentice is monitored and, if necessary, interventions appear to adjust the used relational models. These aspects of the protocol are performed by the facilitator of the expert-apprentice relation: the person that guides and monitors the relation. Within the requirements a clear distinction is apparent between requirements that involve preparing the expert-apprentice relation and requirements on executing the relation. In the protocol these two aspects of the relation will be considered, by creating two separate phases in the protocol. A phase in which the expert-apprentice relation is prepared, and second a phase is which the expert-apprentice relation is performed and executed. A second design consideration results from the emphasis in the design requirements on the social relation between the expert and apprentice. The requirements show that a social relation is an essential aspect of and requisite for optimal knowledge sharing between expert and apprentice. The social relation is the process by which the outcome, sharing of knowledge, is achieved. In the protocol the development of a good social relation, or social bond, is therefore accentuated by focussing on social aspects, bonding and possible negative effects on the social relation between expert and apprentice. A last consideration results from the requirements on expert learning in the expert-apprentice relation. This aspect of expert-apprentice relations will be emphasised in the protocol as well, using the identified possible learning outcomes for experts in expert-apprentice relations. The protocol will emphasise both apprentice and expert learning by identifying relevant side knowledge and by making reflections on the knowledge sharing a central activity in the expert-apprentice relation.

Phase 1: Preparing the expert-apprentice relation

The protocol begins with the creation of an expert-apprentice relation, that is, the matching of an expert with an apprentice. The facilitator matches an expert with an apprentice. The requirements emphasise two factors in the matching of expert and apprentice: the knowledge match and the social match between the expert and apprentice. The knowledge match is on two aspects, the knowledge gap between expert and apprentice and, second, the overlap in their knowledge domains. The knowledge domains of the expert and apprentice need to be clear to the facilitator in order for him to be able to meet the requirements on the optimal knowledge gap and on the overlap in knowledge domain.
The knowledge gap between expert and apprentice is optimal for knowledge sharing when the apprentice is involved in the learning process and is in the stage of competence in the knowledge domain of the expert.

The apprentice’s knowledge has overlap with the knowledge domain of the expert.

The aim of the social match is to enhance the social relation between the expert and apprentice in order to create willingness to share knowledge. An expert is matched with an apprentice with a relatively matching personality. Also, similarities between the expert and apprentice are expressed. The social match can create the conditions in which a social relation can develop.

During the expert-apprentice relation, the expert and apprentice develop a social relation, or a social bond.

The principles of attraction are used to enhance the creation of a social relation between expert and apprentice. The expert is matched with an apprentice who is relatively similar; the expert and apprentice are in close proximity during the expert-apprentice relation; their needs are complementary; and the expert and apprentice express their liking of each other.

The knowledge sharing in relations of short duration profits when expert and apprentice have a personality match. The personalities of the expert and apprentice are analysed in order to match an expert with an apprentice who has a relatively similar personality.

The matching of expert and apprentice served the goal to create optimal conditions for knowledge sharing. Other boundary conditions have to be met in the preparation phase of the protocol. The facilitator makes sure that the boundary conditions are met, during the matching process or later.

An infrastructure is available by which expert and apprentice can share knowledge.

The expert and apprentice speak the same language and can understand each other.

The expert and apprentice have access to the sources of knowledge without restrictions.

The expert and apprentice are willing to share their knowledge with each other.

The expert and apprentice use face-to-face interaction.

The expert and apprentice trust each other.

The expert and apprentice are committed to the relation.

The presence of the apprentice within the organisation and in the proximity of the expert is legitimised.

Next to the boundary conditions, some points of attention have to be considered. Preferably the expert and apprentice voluntarily participate, and some form of contract is used. Also, the expert and apprentice have time available to perform the relation. The facilitator chooses to meet these requirements, or decides on the relevance of specific design.
restrictions and attention points. This also holds for the requirements about the organisation. The expert-apprentice relation is performed within an organisation. The design restrictions and attention points on the match of the expert-apprentice relation with the organisation concern the indication that the relation has to function in a dynamic environment, the sharing of the goals of the organisation, and the restriction that the expert and apprentice have to work autonomously in the organisation.

The last part of the preparation phase concerns instructing the expert and apprentice. Instructions about which activities are part of the expert-apprentice relation, and information about the course of the relation and the task of the facilitator of the relation. The facilitator instructs the expert and apprentice, explains the activities and sets the course for the first period of the expert-apprentice relation. The expert and apprentice can now start their expert-apprentice relation, and the protocol enters the performing phase.

Phase 2: Performing the expert-apprentice relation
In the second phase of the protocol, the expert and apprentice start their expert-apprentice relation. The apprentice is placed in proximity of the expert, that is, in the workspace of the expert. The expert and apprentice perform various activities, both deliberate activities and unstructured activities: observation of behaviour, practising behaviour, explaining and reflecting on the shared knowledge. The activities are explained and monitored by the facilitator:

| The apprentice learns by observing the expert at work, with the expert explaining his actions and the apprentice asking questions. The apprentice then practices the observed behaviour. |
| During the expert-apprentice relation the expert and apprentice reflect on the learning process |
| The activities the expert and the apprentice engage in have to some extent be unstructured. Not every activity in the relation is planned in advance, in order to create unexpected learning opportunities |
| The process of socialisation requires that the expert and apprentice are in physical proximity |

The expert’s type of expertise, I-dominant, S-dominant, or A-dominant, will for a part determine which activities are more relevant – observing and practising knowledge in S- and A-dominant relations and reflecting on knowledge in I-dominant relations for example. The facilitator determines the type of relation and instructs the expert and apprentice. During the performing phase of the expert-apprentice relation, performing the above activities will result in learning outcomes for the apprentice as well as the expert. In learning, the apprentice’s performance level should be reckoned with. The learning outcomes of the expert result from reflecting on existing knowledge, or gaining new
knowledge from the apprentice. Therefore, in the expert-apprentice relation knowledge other than the knowledge in the expert’s knowledge domain is considered. The expert and apprentice are asked to be aware of possible relevant side knowledge.

| During the expert-apprentice relation, expert and apprentice have to look for knowledge outside the expert’s knowledge domain that can be of use for to knowledge domain |
| Expert learning can be an increase in knowledge domain, new synergetic, or new not synergetic knowledge |

During the expert-apprentice relation the facilitator monitors the relation, using several sources of information. The collected information is used by the facilitator to monitor the knowledge sharing in the relation:

| The facilitator monitors and evaluates the expert-apprentice relation with the expert and the apprentice, using techniques like interviewing, coaching and observation. The apprentice hands in logbooks in order to keep track of the performed activities. |

When it is observed that the relation is not functioning optimally, the facilitator can intervene by adjusting the used relation models or by checking if the boundary conditions are being met.

| The facilitator identifies and if necessary adjusts the used relational models, by asking questions about the motives for knowledge sharing |

The facilitator’s evaluation of the expert-apprentice relation may result in additional interventions. For example more instructions on necessary activities the relation.

These two phases of the expert-apprentice relation together form the first design of the protocol. The preliminary design is implemented in a first case study, which is described next.

**Field-test case 1**

In this first case study the preliminary protocol was used. An expert and an apprentice were selected and matched by the researcher who was the facilitator of the relation. The expert and apprentice received instructions on the activities and the goals of the project. The protocol was implemented as described above. The expert and apprentice were interviewed regularly and the project was evaluated during and after the relation. The implementation of the design resulted in an expert-apprentice relation that was evaluated by the participants of the relation as being moderately functioning. The facilitator observed the need for a formal ending of the relation. The social match was not optimal: the expert and apprentice
evaluated their relation as being difficult. They started enthusiastically the relation, but they did not come to like each other. They started blaming each other for not fulfilling the expectations. The expert thought of himself as a visionary and named the apprentice too informal, while the apprentice blamed the expert for being too abstract and formal. As a result the expert was dominant in the relation and, according to the apprentice, controlling. Partly as a consequence of this, the apprentice doubted the expertise of the expert: he did not regard the expert in this relation as a genuine expert, and he therefore did not attach much significance to the knowledge being shared by the expert. The expert interpreted this as a lack of trust.

At the start of the relation the apprentice followed and observed the expert on a regularly basis. The expert tried to provide training opportunities by letting the apprentice take over his work for a couple of days while the expert took a short holiday. The apprentice had access to incoming e-mails and phone calls, and was made responsible for responding in a correct manner. However, after a while the expert-apprentice relation became less intense and lessened further towards the end of the project.

**Lessons learned**

The results of this expert-apprentice relation indicate once more that it is important to consider the personal match between expert and apprentice beyond similarities. This result leads to the need to emphasise further on the matching of the personalities of the participants. In this case the apprentice was given (temporary) access to the expert’s incoming information. When the apprentice has access to all incoming data, whether these are e-mails, letters or newspapers, the apprentice gets an overview of the relevant information for the expert. A lesson learned from this case is that it is important that the apprentice acknowledges the expertise of the expert, and vice versa: the expert acknowledges the apprenticeship of the apprentice. The observation that the relation between expert and apprentice became less intensive in the course of the project indicates that the protocol needs to assure that the expert and apprentice stay committed to their relation. Also, it indicates that the expert-apprentice relation is a process that can change over time.

Above, the results are described of the implementation of the protocol’s preliminary design in the first field-test case study. The results lead to adjustments in the design. An improved version of the protocol is implemented in a second case study and evaluated. This process is repeated and after twenty case studies ultimately results in a final protocol for expert-apprentice relations. The sub-versions of the protocol are not presented here, but in the next paragraph the case studies that followed the first case study are presented. Each case description includes a section with the lessons that were learned in that particular case study.
6.2. Case descriptions

In this section the field-test cases that followed the first case study are described individually. This is done anonymously. After each case it is explained what lessons were learned during that particular case. Firstly, a specific case is described by specifying its characteristics and the results of the implementation. The description of the case is followed by an evaluation of the findings, resulting in adjustments to the design. Not all aspects and characteristics of every expert-apprentice relation are presented here. For example, results that are similar to previous findings are not mentioned again in the individual cases, only those findings are described that are relevant and add to the design. The sub-versions of the design are not presented in this paragraph. The ultimate outcome of the iterative development of the design is presented in chapter seven.

Field-test case 2

The expert in this project was matched with two apprentices. After being matched with the first apprentice he ended the project after a few weeks. The expert initiated the ending of the relation because, according to him, the apprentice was not appropriate for that type of organisation. The expert’s colleagues complained that the apprentice behaved inappropriately and that the apprentice was too informal. The expert restarted with a different apprentice and the project was successfully finished. According to the expert, his organisation consisted of specialists and serious workers. He described the first apprentice as being more suitable for a ‘consultancy firm in the city’. The apprentice agreed that he and the expert ‘did not fit’. The expert thought the second apprentice was a perfect match: he was similar to the workers in the organisation and even looked like he could be one of them.

According to this expert he acquired more relevant knowledge than he had expected at the start of the project: he stated that he had learnt in particular from his apprentice’s theoretical. According to the expert this theoretical knowledge was highly useful in his daily practice. The apprentice claimed he had learnt mainly practical knowledge on how to behave in the organisation and how ‘to play the political game’. The sharing of the theoretical knowledge of the apprentice with the practical knowledge of the expert for the most part took place during joint activities and when travelling to an appointment outside the office. This expert and apprentice claimed that the quality of knowledge sharing was less during structured meeting where knowledge sharing was expected to occur.

In this relation the expert and apprentice shared a hobby which they discussed a lot during the day. Both had a high motivation to enter the project. The expert and apprentice were not equal hierarchically, but said there relationship was like a ‘father and son’, with a lot of trust. A critical remark of the expert was that the apprentice could have taken more initiative. The apprentice responded that the initiative of this relation was with the expert.
Lessons learned
An indication following this project is that the apprentice should fit in the organisation in which the expert operates. The apprentice respects the culture of the organisation and behaves appropriately. The knowledge sharing that was part of this relationship occurred spontaneously during joint activities, and not as a result of structured meetings that were set up with the intention to share knowledge. Therefore in the design it is taken into account that the expert and apprentice should engage in joint activities when the opportunity exists and that the expert and apprentice reflect on the activity and give feedback on each others actions.

This expert-apprentice combination had a father-son like relationship. This had both advantages and negative consequences. They created a trusting environment, but the initiative of the apprentice may have been blocked.

Field-test case 3
In this expert-apprentice relation the expert was relatively young. He and his apprentice created a relationship in which they perceived each other as co-workers or even as friends. This expert and apprentice however, did not fully participate in all activities of the design: for example the apprentice did not hand in logbooks and the expert hardly responded when e-mailed or otherwise contacted. When asked, they perceived their relation as being effective and positive. They were not totally committed to the project as a whole and eventually the expert-apprentice relation turned into a form of internship.

Lessons learned
For the design of expert-apprentice relation it is interesting to analyse why this couple ended their expert-apprentice relation. These results indicate that if an expert-apprentice relation is to succeed, the participants have to be, at least to some extent, convinced of the benefits of working in this type of relation. When participants are not convinced of the benefits this method will be less effective because expert and apprentice are not sufficiently motivated.

Field-test case 4
In this project an apprentice was matched with two experts instead of one. The expert that was first contacted to participate in the project proposed a research subject that was not part of his main expertise and therefore another expert, with knowledge in that specific domain, was asked to join the relation. The two experts had structured conversations on the progress and development of the apprentice. At the end of the project all three participants were positive on the relation and on the results of the knowledge sharing. The experts claimed that they had gained new relevant knowledge on the research topic and had benefited most from the results of the self-reflection which was an outcome of coaching the apprentice.
Lessons learned
This project indicates that self-reflection is a valuable outcome to the expert in an expert-apprentice relation which can result from coaching the apprentice and in structured conversations. The results which concern the participation of two experts in this case are not further included in this research.

Field-test case 5
The results of the knowledge sharing in this next project show a clear distinction between the sharing of content knowledge and social skills. The expert and apprentice had relatively equal knowledge domains, with the expert having expertise and the apprentice having mainly theoretical knowledge in that specific domain. The knowledge sharing in this domain resulted in both expert and apprentice gaining new relevant knowledge, which, according to the expert, ‘makes me more effective and a better expert in my domain’. According to the expert one result of the expert-apprentice relation was particularly valuable to him, namely a greater awareness of the content and value of his own expertise and knowledge. When the apprentice was asking questions, observing his actions and questioning his performances, the expert became consciously aware of his actions and knowledge: “I did not realise that I did that”. This awareness created self-reflection on his expertise and knowledge.

The expert opened up his work domain and the apprentice accompanied the expert in his daily activities. The apprentice was an eager student, who was curious and critical. However, for the expert to be a complete expert and to act effectively in his job, social skills are essential. The results of the sharing and learning of these social skills were disappointing to both expert and apprentice. According to the expert the reason for these disappointing results was the apprentice’s lack of grounding: the knowledge gap was too large. According to the apprentice the expert’s personality was too different from his own, making the expert’s way of acting unsuitable for the apprentice. This resulted in what they both say was a somewhat strange relationship: when discussing knowledge that was in their mutual knowledge domain they got along fine and appreciated each other highly, but on a more social (or: informal) level their relationship struggled and had negative side effects.

Lessons learned
Reflecting on one’s own knowledge and on the relationship in which one participates, seems to be a valued aspect of the expert-apprentice relation. According to Schön (1983) reflection in and on action is an important aspect of being a professional. Reflecting on oneself and the relationship should therefore be added in the protocol.

This relation indicates that there may be variations in sharing different kinds of knowledge: sharing social skills or sharing content knowledge. When matching an expert with an
apprentice the knowledge gap in different relevant areas should be included: it is insufficient to only limit the matching to the expert’s knowledge domain.

Field-test case 6
In this project both the expert and apprentice were highly motivated for the project to succeed. Because the expert’s working environment was in a secured area with a restricted admission policy, the expert had to arrange for the apprentice to be able to follow and accompany him. Because the expert made such an effort for his apprentice, the project gained a certain prestige within the organisation which served to motivate the couple even more. Despite their motivation, this project suffered a lack of similarity between expert and apprentice. Their knowledge sharing was on a relatively basic level. According to the expert he had learnt new things, but these were not very relevant for his own expertise.

Lessons learned
This project indicates again that in expert-apprentice relations the expert and apprentice must have some mutual ground to be able to build on their relationship: without some mutual knowledge or interests, knowledge sharing in the expertise domain of the expert is of little relevance to the apprentice or the expert. This project’s status in the expert’s organisation had a positive effect on the relationship and motivation of this couple. Because this project was considered a special project by the organisation and it was considered ‘an honour’ to be participating in it, the expert and apprentice felt ‘almost obliged’ to make the best of it; an indication for the design can therefore be that adding status and prestige to the expert-apprentice relation can increase the motivation to achieve above average results.

Field-test case 7
The expert and apprentice in this project were to some extent both experts and apprentices: they shared knowledge in a similar domain, but differed in skills and experiences. The expert in this relation had most technical expertise, while the apprentice was an expert in communicating the technical issues. The technical as well as the communicating skills were both relevant for the shared knowledge domain. They acknowledged each other’s expertise and differences and claimed they both gained new and relevant knowledge for their knowledge domain. Furthermore, both expert and apprentice stated that in participating in this project, with people watching and observing them, they became more consciously aware of their role in the relation. This awareness also resulted in an increased motivation to have an effective relationship. Related to this, the expert and apprentice stated that as a result of the high expectations they tended to work harder to fulfil these.

Lessons learned
This relationship can be characterised as a two-way expert-apprentice relation, in which participants are both expert and apprentice and share knowledge in a shared knowledge domain. This can be assigned as a specific type of expert-apprentice relation. A second
result of this case was the awareness of the impact of external observation on the relation: this indicates that if the relation between the expert and the apprentice is evaluated by others this can have positive effect on the motivation of the participants. Also, the high expectations people have when participating in this project were said to result in increased motivation and willingness to achieve higher results.

Field-test case 8
This project started off as an expert-apprentice relation with two experts participating. However after a few months it became clear that one expert had ‘retired’ from the project and had left it in the hands of the second expert and apprentice. He did not officially resign but he was absent from most meetings and left all decision-making with the other expert and apprentice. The expert then lost his motivation to participate because, according to him, the results were no longer significant to the organisation with the first expert being absent. The apprentice felt he was not being appreciated. The second expert and apprentice did finish their project, but the results were not highly valued. The first expert said afterwards that he was disappointed by the quality of the apprentice and therefore took less interest in participating in the expert-apprentice relation, but because he thought the other expert valued the relationship he did not mention this during the project.

Lessons learned
This relation indicates that it is important in expert-apprentice relations to express and communicate results within the relationship, especially if the results are disappointing or if the level of the fellow-participants is not as high as expected. Because these disappointments were not communicated in this project, the relation continued without being valued by the participants.

Field-test case 9
The expert in this project was an entrepreneur with a distinct expertise: his knowledge domain consisted predominantly of technical knowledge, but he lacked the knowledge to market his expertise. He requested an apprentice with knowledge in his domain combined with knowledge in marketing. His apprentice had marketing knowledge, however not much technical knowledge. In their project the knowledge sharing was very difficult: they did not understand each other, and were not able to share each other’s knowledge. Because of this distance the expert did not benefit much from the apprentice’s marketing knowledge and the apprentice gained little technical knowledge during the project. The relationship between the expert and apprentice was formal and reserved.

Lessons learned
In this project the relationship between expert and apprentice was negative and reserved and the results of knowledge sharing were almost nil. This relation adds the need to be able to prematurely end an expert-apprentice relationship. Even though the expert and
apprentice did not indicate that they wanted to end it, it was clear that this project did not live up to expectations. The expert and apprentice continued spending time and effort in this relation only because they had committed themselves to do so. There was the need for an ‘escape-route’: the possibility to prematurely terminate the relation if results are unsatisfactory.

Field-test case 10
According to the apprentice, the expert in this project had a dominant personality: he was convinced of his own expertise and at the start of the project he did not think that the apprentice could add anything valuable to his knowledge. The expert did not work in a regular office: his workdays consisted of visiting projects and having meetings with clients. At first the apprentice only accompanied the expert once or twice, and neither expert nor apprentice was satisfied with the relationship. This changed when the apprentice decided to ‘stand up for himself’ and started to accompany the expert on a regular basis and posed questions about the whys and wherefores of the expert’s actions. At first the expert was somewhat hesitant, but after a while he saw the surplus value of the presence of the apprentice and he participated enthusiastically in the project. The change that this relationship went through was solely the result of the apprentice’s changing behaviour: through his initiative the expert and apprentice spent more time together which enabled them to share their knowledge.

Lessons learned
The results of this project indicate that the changing behaviour of one participant can completely change the course of an expert-apprentice relation. Because the apprentice was able to show the expert the advantages of the method, the results of this relationship were satisfactory to all participants. When the apprentice is pro-active and willing to take the initiative in the relation, this can stimulate the expert-apprentice method. However, at the start of the project the expert did not think he could learn anything from the apprentice’s presence and as a consequence the expert only tried to ‘transfer’ his knowledge without being receptive to the apprentice’s knowledge. To be able to stimulate knowledge sharing in expert-apprentice relations it is therefore important that the expert believes and expects to learn from the apprentice’s presence and that he is receptive to the apprentice’s knowledge and input. Another lesson from this case is that the expert and apprentice should have a joint workplace. When there is no shared workplace, i.e. when the apprentice is not present at the expert’s workplace, no unstructured meetings and observations can take place. Thus, when the expert and apprentice are in physical proximity, the relation benefits.

Field-test case 11
Two experts were assigned to take part in this expert-apprentice relation. At the start of the project the experts and apprentice agreed upon the apprentice observing the experts is their daily activities. According to one expert he had misjudged the relation: he had not realised
the implications of being in an expert-apprentice relation. This expert said that in most cases it was not suitable for the apprentice to accompany him to his meetings with clients or to observe him in his daily routine, because this could damage the relations with his clients and co-workers. The apprentice accompanied the two experts to several meetings, but only when his presence ‘could do no harm’.

**Lessons learned**

An indication for the design that can be concluded from this project involves the willingness of the expert to open up his working routine to the apprentice. The apprentice should be granted access to (almost) all working areas of the expert. Of course, there may be exceptions when the presence of an apprentice is inappropriate, but the starting point of the relation must be that the apprentice has legitimate access to the world of the expert. Another lesson resulting from this case is the need to include coaching in the relation when possible. In this project both experts and apprentice had positive experiences from their conversations where they openly aired their thoughts and difficulties. This can be helpful in creating a bond between expert and apprentice.

**Field-test case 12**

The apprentice in this expert-apprentice relation had a lot of activities outside of the project. Due to a lack of time, the relation between this expert and apprentice did not meet expectations: the apprentice did accompany the expert and observe him on some occasions, but did not do this structurally because of his other obligations. The expert and apprentice agreed upon this distant relation, which in the end was all but non-existent.

**Lessons learned**

This project demonstrates that for the expert-apprentice relation to succeed the apprentice as well as the expert has to reserve enough time to take part in the relation: participation in such a relation should therefore be a priority in both expert and apprentice schedules.

**Field-test case 13**

The expert and apprentice in this project positively evaluated their relation. They claimed that participating in the expert-apprentice relation had contributed to their performances and they both saw a clear development in knowledge. However, both expert and apprentice said that with hindsight they were not well matched. Although they tried hard, they ‘just were not each other’s type’. The expert liked classical music, while the apprentice preferred rock; the expert played golf whereas the apprentice was prejudiced against golfers and only played video games, the expert was conservative and the apprentice progressive. According to these participants they had nothing in common. The expert claimed that this did not necessarily have a negative effect on the relationship, but it prevented the relation from becoming ‘more than the sum of the parts’ because they could not relate to one another. The participants in this project further claimed that it is important for the apprentice to have
a critical approach in the relationship with the expert: the expert did not want the apprentice to imitate him; he wanted the apprentice to be a critical observer.

**Lessons learned**

This project indicates that in matching an expert with an apprentice it can be useful to take into account if the participants can to some extent relate to one another. If the expert and apprentice are too far apart, this will prevent the relation from being fully effective. The opinions and views on the world can be so disparate, that it is hard for the expert and apprentice to create a bond. They should have something in common. Another lesson from this case is that when the apprentice is not merely an unquestioning follower or admirer, but a knowledge partner who gives feedback, the expert is challenged and situations are created in which the expert can improve his expertise. The apprentice should have a critical approach towards the expert.

*Field-test case 14*

The expert and apprentice in this project evaluated their relation as being complicated. In the course of the project it was concluded that this complicated relationship came as a result of their contrasted orientations within the project. The expert’s nature was task-oriented, whereas the apprentice was more oriented on the relationship. As a consequence of this the expert complained that the apprentice did not work hard enough, while the apprentice complained that the expert was too formal and was not interested in the welfare of his apprentice. Because they were both relatively extreme in their standpoints, they did not understand each other. As a result, according to the apprentice the expert did not trust him to succeed in his task and in return the apprentice did not trust the expert enough to open up. The expert agreed that there was a lack of trust. This resulted in incomplete knowledge sharing: the expert shared information and the apprentice observed the expert, but without understanding the ‘whys and wherefores’.

Another obstacle in this relation was that the expert did not have the authority to decide whether or not to let the apprentice accompany him on a regular basis. Each time he wanted the apprentice to observe him during meetings for example, he had to get permission from his manager. Both the expert and the apprentice found that this hindered their relation.

**Lessons learned**

As a consequence of the orientation differences between this expert and apprentice (task oriented vs. relation oriented), knowledge was not optimally shared. This observation leads to conclusion that there should be no large differences in orientation between an expert and apprentice, or even that the orientations should be similar. According to this couple, the differences in orientation resulted in a lack of trust which was the main reason for the incomplete knowledge sharing. The expert did not trust the apprentice enough to show the difficult aspects of his expertise, whereas the apprentice never expressed that he felt
insecure in the organisation. Trust is therefore again emphasised in the design of expert-apprentice relations. A third lesson arises from the lack of authority of the expert: the fact that the expert did not have the authority to make decisions about the presence of the apprentice hindered the unstructured nature of the expert-apprentice relation. The expert should have the authority (within the organisation) to make decisions regarding the apprentice’s presence.

Field-test case 15
The expert in this project was motivated to act in this expert-apprentice relation. However, in the course of the project because of a personal matter that occurred during the project, he frequently called in sick and was absent. Finally, the expert and apprentice decided that this personal issue prevented the expert from fully participating in the project and the participants ended their expert-apprentice relation.

Lessons learned
Notwithstanding the motivation of the expert and the apprentice, this relation ended prematurely. This project shows that some practical requirements have to be fulfilled to be able to act in an expert-apprentice relation. In this case, the (personal) environment of the participants should not impede the expert-apprentice relation.

Field-test case 16
The knowledge domain of the expert in this project consisted largely of specific technical knowledge. He was an expert in a highly specialised subject and had gained his expertise without a formal education, through years of experience in the field. He was considered an expert by his peers, but could never explain his actions to others. This was a result of both the construction of his expertise and a lack of social skills. The apprentice in this project was a student with a technical education in the field of the expert’s knowledge domain. The knowledge sharing in this relation was evaluated as being very useful to both expert and apprentice. The expert claimed that the theoretical knowledge of the apprentice mainly confirmed his ideas. Although the expert had expertise in a specific knowledge domain, he did not know how to ‘sell’ it to his clients. The apprentice had good social skills and unintentionally shared his ‘marketing knowledge’ with the expert. As a result, the expertise of the expert broadened.

This project went through several phases. The participants of this relation identified three phases: the first phase is the ‘acclimatisation phase’ in which the participants had to get used to one another and their roles. The second phase is the ‘working phase’ in which the expert-apprentice relation was practised and the project was at its peak. The last phase that they distinguished was the ‘closing phase’ where the participants rounded off their relation and the project was ended.
Lessons learned

The expert and apprentice had matching knowledge domains, with the expert’s knowledge being largely tacit, and that of the apprentice being achieved through formal education. Because the apprentice had basic knowledge in the field of the expert, the socially unskilled expert could ‘hook on’ without having to ‘translate’ all his actions and ideas. The expert gained knowledge from the presence of the apprentice on how to approach new clients and how to communicate with them. The sharing of this knowledge was not intended. This result suggests that an expert-apprentice relation can unintentionally result in relevant new knowledge for the expert. The participants in expert-apprentice relations must be receptive to unintended but relevant knowledge sharing.

All expert-apprentice relations distinguished several phases in their relation. One should be aware of the occurrence of these phases. The design should therefore recognise expert-apprentice relations as consisting of different phases.

Field-test case 17
In this project, time played an important role: the expert had a very tight schedule and hardly any time reserved for structured meetings with his apprentice. The apprentice was able to observe the expert, and watch him practice his expertise, but there were no opportunities to ask questions or to reflect on the observed behaviour. Let alone for the apprentice to practice the skills himself. The apprentice decided to manage the factor time creatively. He decided to accompany the expert in his car on every possible occasion in order to spend more time together. The apprentice as well as the expert said their relationship positively changed after the apprentice accompanied the expert in his travel time: they used these moments to give each other feedback and to reflect on their relation.

Lessons learned
Observing the results of this project, point of attention for the design of expert-apprentice relations is that the participating expert and apprentice should be creative in handling obstructing aspects in the relation, like, for example, lack of time. Because no meetings were planned in advance, the design of the relation was mainly a result of the expert and apprentice being flexible and creative.

Field-test case 18
In this project the apprentice went through a clear development. At the start of the project the knowledge sharing was aimed at the expert teaching the apprentice. After a while the apprentice had gained considerable knowledge in the expert’s knowledge domain and wanted to develop further. According to the apprentice however, the expert still treated him like he had just started the project. The expert did not acknowledge the development of the apprentice and did not adjust his behaviour accordingly. It prevented the apprentice from
developing further. Another consequence, according to the apprentice, was that it also prevented the expert from learning from the (new) knowledge of the apprentice.

**Lessons learned**

When participating in an expert-apprentice relation, both expert and apprentice will change and develop as a result of knowledge sharing. For the knowledge sharing to continue the relation must be adjusted following the developments of its participants. The expert as well as the apprentice should therefore adapt to the changes and developments that are a result of the knowledge sharing.

*Field-test case 19*

In this project two experts and one apprentice participated in the expert-apprentice relation. During this project it turned out that the second expert did not add any surplus value: the apprentice said he only consulted him every once in a while because he felt obliged to do so. The expert-apprentice relation therefore existed mainly of the apprentice and the first expert. The expert was moderately positive about the apprentice’s performances. The expert said that he sometimes felt irritated because the apprentice did not always grasp his explanations: according to the expert, the knowledge of the apprentice was sufficient to be useful, but the apprentice’s intelligence did not always suffice.

**Lessons learned**

The experts commented on the ability of the apprentice to grasp their explanations and to understand their feedback on his performance. This indicates once more that the intelligence of the apprentice plays a part in the knowledge sharing between expert and apprentice.

*Field-test case 20*

The expert in this project was satisfied with the results of the project. According to him he shared valuable knowledge with the apprentice. The expert qualified his expert-apprentice relation as being good and meeting his expectations. The apprentice had a different view on the relationship. According to the apprentice the expert-apprentice relation never reached its full potential because the expert remained too formal and impersonal. The apprentice viewed the refusal of the expert to open up on his personal life as a lack of trust. The apprentice evaluated the relation less positively than the expert.

**Lessons learned**

The different views of the expert and apprentice on their relationship indicate that they had different expectations regarding the bonding between expert and apprentice in an expert-apprentice relation. The expert in this project claimed that an expert-apprentice relation can be successful without sharing personal information and without getting emotional. However, this apprentice thought that sharing personal information is an essential part of
the expert-apprentice relation because it is an essential condition for the expert and apprentice to bond. The findings of this project indicate that expert and apprentice should have similar expectations about what should be included in the relationship and what not. Also, it indicates that the expert’s and apprentice’s need for a personalised relationship should be similar.

6.3. Overview of the twenty cases

This paragraph presents an overview of the twenty case studies in which the protocol for expert-apprentice relations was developed. Chapters 2, 3 and 4, resulted in a list of design requirements that was used to create a preliminarily version of the protocol. The design was then developed during the twenty field-test case studies.

A returning issue in the field-test cases were the possible variations of expert-apprentice relations. The findings suggest that there can be several types of expert-apprentice relations. The general question that needs to be answered is what types of relations are possible and which types of relations are relevant in this research? The specific case results suggest that expert-apprentice relations can vary on at least three dimensions. The three dimensions that can be identified by analysing the available results on types of expert-apprentice relations are form, process, and content. In other words, the types of expert-apprentice relations can be based on the composition and number of participants, on the type of social relationship, and on the knowledge that is to be shared within the relation. This research focuses is on the expert-apprentice relation being a relation between one expert and one apprentice. During the case studies there were a couple of expert-apprentice relations with more than one expert. These relations contributed to the design in some form, but in the final design only expert-apprentice relations consisting of one expert and one apprentice are included. Therefore the first identified dimension, form, is not included in the process of defining the types of expert-apprentice relations in this research. The second dimension, process, has to do with the (social) relationship between expert and apprentice: types are based on how the relation is carried out. Expert and apprentice can be close or distant, in their relationship as well as in their actions. For example, some experts and apprentice have a strong emotional bond, while others remain relatively distant. The third dimension, content, defines the types of expert-apprentice relations based on the knowledge that is to be shared. As was described in chapter two, there are different types and kinds of knowledge, all of which can be the subject of knowledge sharing in an expert-apprentice relation. Knowledge sharing is the goal of expert-apprentice relations, the social relation is the means to that end: the social relation between expert and apprentice is used to achieve knowledge sharing between them. For this reason, this research places more emphasis on the content dimension than the process dimension. The content dimension is therefore used as the starting point for defining the different types of the expert-apprentice relation – the basic types of relations. The types of expert-apprentice relations that can be identified based on the content
The twenty case studies showed variations in type of knowledge sharing, the social relation and performed activities. Table 6 gives an overview of the various characteristics of the twenty case studies following the dimensions form, content and process. The dimension form describes the duration of the relation and whether the form was consisted with the intention, that is one expert with one apprentice. In the cases where two experts participated instead of one, only data relevant for one-expert relations is given. The second dimension, content, describes the dominant relation type in that particular case. The relation types are concerned with the type of knowledge that is to be shared in the expert-apprentice relation. The dominant relation types are the Attitude-dominant relation (A-type), the Skills-dominant relation (S-type), and the Information-dominant relation (I-type). The second item in the content dimension holds a specification of the knowledge match between the expert and the apprentice. It concerns the extent to which the knowledge domains of the expert and apprentice overlap and the knowledge distance between the two participants. The process dimension contains an evaluation of the social relation and some characteristics of the performed activities in the relation.

<table>
<thead>
<tr>
<th>Case</th>
<th>Form Type</th>
<th>Content Type</th>
<th>Knowledge Match</th>
<th>Evaluation of Social Relation</th>
<th>Characteristic of activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6/2 exp.</td>
<td>A-type</td>
<td>Apprentice questions expert’s expertise</td>
<td>Formal, personality differences</td>
<td>Close proximity, full access</td>
</tr>
<tr>
<td>2</td>
<td>7/1 exp.</td>
<td>S/A-type</td>
<td>Relevant side knowledge of the apprentice</td>
<td>Father-son like Appr. matches the culture of the org.</td>
<td>Apprentice present with all activities</td>
</tr>
<tr>
<td>3</td>
<td>6/1 exp.</td>
<td>I-type</td>
<td>Match of knowledge domains</td>
<td>Strong social relation</td>
<td>Withdrew from activities of the protocol</td>
</tr>
<tr>
<td>4</td>
<td>6/2 exp.</td>
<td>I-type &amp; A-type</td>
<td>Observation and reflection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6/1 exp.</td>
<td>I/S-type</td>
<td>Two working knowledge sharing paths</td>
<td>Appreciated but troublesome</td>
<td>Questions, accompanying daily activities</td>
</tr>
<tr>
<td>6</td>
<td>5/1 exp.</td>
<td>I-type</td>
<td>Lack of overlap in knowledge domains</td>
<td>Highly motivated relation</td>
<td>Expert had to legitimise access appr.</td>
</tr>
<tr>
<td>7</td>
<td>7/1 exp.</td>
<td>S/A-type</td>
<td>Complementary</td>
<td>Awareness,</td>
<td>Critical</td>
</tr>
<tr>
<td>No.</td>
<td>Type</td>
<td>Domain</td>
<td>Social Bond</td>
<td>Questions and Feedback</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>--------</td>
<td>-------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>2</td>
<td>S/A-type</td>
<td>Disappointments not expressed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>1</td>
<td>S-type</td>
<td>Relevant side knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Negative relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Few activities</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>1</td>
<td>A-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Developing relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reflection</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>2</td>
<td>S/A-type</td>
<td>Coaching. No legitimised access</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>1</td>
<td>I-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No priority</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No priority due to other obligations</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>7</td>
<td>1</td>
<td>I-type</td>
<td>Large knowledge distance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Different personality types</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Critical observation</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>8</td>
<td>1</td>
<td>A-type</td>
<td>Large knowledge distance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Complicated relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No authority to decide of presence apprentice.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>1</td>
<td>S-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Obstruction from outside the relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Obstruction from outside the relation</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>6</td>
<td>1</td>
<td>S-type</td>
<td>Relevant side knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Good social relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distinct phases</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>6</td>
<td>1</td>
<td>A/I-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Motivated relation, developing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time-management</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>6</td>
<td>1</td>
<td>A/I-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Developing relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Changing role of apprentice</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>7</td>
<td>2</td>
<td></td>
<td>Few activities</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>1</td>
<td>I-type</td>
<td>Domain overlap</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Different views on relation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expert evaluated as not being open</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6  Overview of the individual case findings**

This chapter described the twenty field-test case studies through which a protocol for expert-apprentice relations was designed. The process started with a preliminary design in a first case study and now results in a final design of the protocol. The next chapter presents this final protocol: the C4 protocol for expert-apprentice relations.