Chapter 10

Discussion

10.1 Introduction

Knowledge plays an important role in the innovation process, but what actually happens to this knowledge [accounting for its importance] mostly remains unclear. The aim of the present study was to develop a model to study the knowledge dynamics during organizational innovation. A particular focus was to use this model to study knowledge dynamics of individuals in a field setting. We hereto proposed a cognitive-semiotic model, in which three – cumulatively related – types of knowledge were distinguished. We investigated and explored the tangibility of knowledge types and factors that influenced the innovation – knowledge relationship.

This final chapter will reflect on the model presented in chapter 4, the field study using this model and results of our field study. We start with discussing the methodological part of our empirical study on knowledge dynamics [10.2]. Then we discuss the results of our study [10.3] split into four parts, focusing on organizational aspects [10.3.1], planning aspects [10.3.2], knowledge aspects [10.3.3] and innovation aspects [10.3.4] respectively. We conclude this thesis with an evaluation of de cognitive-semiotic model that we presented [10.4].

10.2 Methodological aspects

Regarding the methodological part of this study we want to make three concluding remarks. First of all, our study was the first [as far as we know] to directly measure [types of] knowledge at the individual level [of the planners] instead of using indicators, such as level of education. Secondly, in addition to the first remark, we also made the dynamics of knowledge tangible, as we measured the knowledge types of planners at different points in time during the innovation process. And thirdly, our study provided insights in measuring knowledge and doing [semi] longitudinal research on knowledge dynamics during organizational innovation. These insights can be considered a starting point for new research. The insights gained can be summed up as follows.
First of all, most people hardly reflect on the knowledge that they use to perform their jobs. So, asking people about this knowledge stirs things up. They start to think about their tasks and they try to envision situations in which the knowledge is used. This effort is often perceived as difficult and therefore it takes time. Furthermore, the knowledge that people have may be very vivid, but very implicit [at first reflection] as well. Note that this does not necessarily mean that this knowledge is only sensory, as our study shows. So, studying knowledge types has an impact on the subjects participating in the study.

Secondly, our empirical study on knowledge types had no precedent reference. We therefore chose an operationalization strategy, which allowed some latitude; we chose to set up our study broadly and we tried to capture as many related aspects as possible. We formulated a divers set of questions. However, this strategy did not have the outcome we hoped for, namely a set of questions that together formed three constructs representing the three knowledge types of the cognitive semiotic model. As the previous chapter showed, the three groups of questions that were distilled did not include the key-questions that we formulated. Interestingly, though, these key-questions seemed to behave more as outliers than as centre questions within the groups of questions. This insight shows us that these key questions indeed have something unique within the overall set of questions. Further research on the operationalization, preferably a larger population to study, will help us to get a firmer grip on bridging this gap between theory and practice.

Thirdly, in our attempt to link our theoretical framework to an empirical study we operationalized this study as closely as possible to the theoretical concepts. This may not come as a surprise to academics. However, although, this strategy may be technically possible and academically correct many of the planners who participated in our study experienced the questionnaire as very academic and sometimes even farfetched and too analytical; they indicated that the questionnaire wandered in too much detail and that it seemed that we asked the same question more than once. So in a sense, for fear of not correctly operationalizing our theoretical point we dared not to simplify the formulation of our questions in our translation of the theoretical concepts to indicators that can be operationalized. In communication with non-academics the nuance of the selectively formulated questions is lost most of the time, as non-academics or even academics outside the field do not understand the difficultly formulated questions. This leaves us with the choice to either formulate the questions more loosely, a hard thing to do for academics, or to choose a more personal method
of data collection [and therefore requiring more labor]: gathering the data in person; being present when the questionnaire is filled out can support the planner through rephrasing questions and giving additional information. Furthermore, the planners provide useful extra information for the interpretation of the data. Of course a combination of the two will do extra.

Finally, in our attempt to capture the knowledge that planners have, we formulated various questions aiming at what planners know and how they apply their knowledge. It turned out that the reliability of the various groups of questions asked was rather low [Cronbach’s alpha < 0.50] and after manipulating the set of questions by putting some new ones in and taking others out it turned out that the most relevant questions in terms of validity should be omitted. We found this not acceptable. This left us with the choice between validity and reliability. We chose for validity. Having to make this choice was a disappointment. Future research should point whether we made the right choice, or not.

10.3 Theory

10.3.1 Organization

In interpreting our data and exploring its possible generalization we want to note the following regarding the data collection at Bartiméus, a large care institution. We particularly want to relate the size of Bartiméus to the increase of coded knowledge that our study showed. Coded knowledge is based on consensus, on agreeing on the interpretation of a code. The greater the group the longer it takes to reach consensus and to develop strong codes. So, this would imply that a bigger organization would take longer to develop strong codes, as the consensus should apply to a greater amount of its members. This could imply that smaller organizations will develop either stronger codes than we have observed at Bartiméus or they will develop their codes faster than we saw at Bartiméus. This is a discussion for further research. We demonstrated that the knowledge within organizations resides in individuals; this knowledge changes, has to be attuned, integrated and shared. Larger organizations make physical co-presence of individuals more difficult and therefore the role of coded knowledge becomes more relevant. However, it comes with a price.
10.3.2 Planning

As agreement on the interpretation of coded knowledge, consensus, is a crucial assumption in using coded knowledge, it is vital that coded knowledge is communicated and not just used by the one planner making the duty roster. Communicating coded knowledge will stabilize this knowledge and in this sense it will help to speed up the knowledge dynamics and thus the innovation process. We therefore suggest that planners be stimulated to communicate with each other about making the duty roster. Furthermore, communicating with other planners will ensure rehearsal of coded knowledge and it will improve the use of these codes. In order to stimulate communication among planners they should work together; pair the planners during the training and have them work together on making the duty roster additionally to the training period.

10.3.3 Knowledge

As a result of the introduction of the planning software ZKR we expected the theoretical knowledge to increase. However, the data showed a decreasing tendency, contrary to our expectations. In trying to understand and explain this possible structural trend we go back to the essence of theoretical knowledge, which is to understand concepts in relation to other concepts in its structure and in its coherent pattern. Furthermore, theoretical knowledge is built up of sensory knowledge and coded knowledge. Now, if we take this line of thought then a change in coded knowledge automatically affects theoretical knowledge, in the sense that the theoretical knowledge will be restructured and the concepts will be repositioned. So, an increase of coded knowledge in this sense can lead to a – probably temporal – decrease of theoretical knowledge, as a new structure needs to emerge. In other words, it takes time to adjust and make sense of the new situation. This is important to consider. The training of employees to work with the new planning software should pay considerable attention to the use of coded knowledge. Too great an emphasis on just the ‘logic’ of the software, without embedding it in the day to day routine of making the duty roster, leaves a gap in the knowledge development of the employees. Acquiring coded knowledge, knowing it and understanding it is important. This is particularly relevant to the experienced planners who have strong coded knowledge. Boisot refers to a lock-in effect that can be created once knowledge is coded. These planners will have greater difficulty to adapting their coded knowledge than will novice planners. Therefore, we suggest paying extra attention to this group of planners.
Then, we address the subtasks. Although no general [significant] patterns of differences between the subtasks emerged, we did come up with some interesting findings. For instance, the increase of coded knowledge was found over all tasks, but in particular we saw a steady increase for the subtask of negotiating compared to gathering information. We expected the coded knowledge of negotiating to be lower than that of gathering information, which in fact was the case. Then, although the coded knowledge for gathering information increased significantly after the training, over the whole implementation period negotiating showed more increase. It could be that gathering information is more directly a part of the planning process, whereas negotiating is more indirectly involved, in the sense that the ZKR software does not directly support it. In this way the effect of the new way of working will take longer to show for negotiating than it would for the subtask of gathering information. This implies that activities that are not directly supported by the implementation process should not be overlooked, as the innovation process will affect them as well. This is especially important to note, as it seems that these effects will take longer to show. The introduction of software, such as ZKR, to support planning will have effects that were not intended beforehand. The increase of coded knowledge on negotiating is an indicator that planners use more standardized procedures to negotiate about the duty roster. An often-heard problem is that rules and regulations used for the duty roster are not clear, neither for the planners nor for the people who are to be scheduled. The increase of coded knowledge that we measured on the planners might not just have been limited to them; the people who are to be scheduled might also show an increase of coded knowledge. Making the duty roster more transparent to all parties involved will create a greater level of acceptance. This is a crucial factor to ensure the success of the duty roster in the long term.

Regarding the training effect that we observed we want to make the following remark. Learning is not something that just happens [Leonard-Barton 1995]; it is a process that should be stimulated and facilitated. Boisot distinguishes N-learning from S-learning. An important difference between these two types of learning is in the approach to the value of knowledge. Whereas N-learning focuses on the ‘absolute’ accumulation of knowledge, S-learning sees knowledge as more relative. That is, the accumulation of knowledge is not building up to a higher sense of wisdom. Rather, the accumulation of knowledge should always be valued in a larger perspective. From our cognitive-semiotic standpoint this essentially implies, that theoretical knowledge is essential for knowledge dynamics; one needs to
have a model to perceive differences, the beginning of the learning process. So either the planners already have this model or such a model should be provided. We relate theoretical knowledge to experience and expertise. Reviewing the data of the novices and experts showed that the novice planners had a greater increase of coded knowledge than did the experienced planners. Interestingly, the theoretical knowledge between the novices and the experts after the implementation had been completed only differed fractionally in favor of the novices. So, although the novices had less coded knowledge before the implementation of ZKR they ended up with almost the same amount of theoretical knowledge as did the expert planners. This could imply that the novice planners are more aware of their own way of planning than are the experts. This idea is supported by the fact that the expert planners have more sensory knowledge before the implementation than the novice planners do. So interestingly, for the overall implementation of support software, [from the decision to start, to finally working with ZKR, almost 1.5 years later] it might well be that the expert planners need more guidance in working with the new software than the novice planners do; they have to learn and practice as well as 'un-learn' and un-practice'.

The contractual hours influenced the knowledge dynamics of planners in that planners who worked part-time showed a decrease in their coded knowledge and planners who worked full-time showed an increase. A possible explanation for this difference could be that full-time workers have more routine in scheduling with ZKR. For instance, because they have more time and more opportunities to explore the new planning software. Part-time workers might have a tighter schedule when they work, as they need more time to get into their working rhythm in comparison to full-time workers. So, for the implementation of decision support it should be kept in mind that part-time employees can differ in their learning process from full-time employees. Extra attention to this point could be translated into a decision to link part timers and full timers during the training to work together to get to know the program.

10.3.4 Innovation

All in all, we started this study to gain more insight into the knowledge dynamics of individuals to better understand the organizational innovation process. We can say we have. Now what are the practical implications for organizations that are on the verge of starting such an innovation process?
Innovation, especially introduction of software, is a process, which entails structural changes in the types of knowledge that people use to perform their jobs. These changes should be considered beforehand. An important key to facilitate the innovation process is to have an inventory of the knowledge that people have and use as this knowledge forms the starting point for the innovation process; it is the input. Making an inventory, as part of the innovation process, will have the positive side effect that people will reflect on their knowledge. This reflection will generate more awareness of making the duty roster, which can function as better input to set criteria for the implementation process.

The knowledge is at the same time the input, throughput as well as output of innovation. Therefore, knowledge changes and this will have unintended effects, positive ones as well as negative ones. One effect that we mentioned earlier is the increase of coded knowledge for negotiating. This allows more transparency in the process of making the duty roster. As perceived fairness is an important factor in making the duty roster, the increase of coded knowledge for negotiating might even be considered a must.

The implementation process has practical implications as well. For instance, one planner explained that the new way of working cost much more time. She used to make the duty roster during outside activities. She could then sit outside and make the duty roster while keeping an eye on the clients who were enjoying themselves on the lawn. The implementation of ZKR made this way of working no longer possible, as the making of the duty roster had been restricted to one particular place, behind the computer. An inventory beforehand on how people are used to make the duty roster could have helped in this situation as well. A solution could be to have notebooks available to make the duty roster. Other practical problems include not being able to make a full color print or not to have enough room behind the computer for more than one person to sit. These problems in the practical use of the new software tool could also be overcome by doing a thorough inventory at the beginning of the innovation process. Planners should be allowed to have enough time to gradually switch from the old way of working to the new way.

Innovations, and the implementation of new software that changes working practices, bring along mental load. The way of working changes and this interferes with routines. And of course knowledge of people changes. This will all take up time. So, perceiving an innovation process just in terms of efficiency and earning money will not help. Proper preparation and facilitating the end-users in both
content related and practical aspects of the innovation process should be considered more as a must rather than as a luxury that cannot be afforded.

Innovation processes revolve around people. If they do not accept the new way of working and everything that comes along with this then the innovation will most definitely fail. For management to take into account the ways of working and in particular the changes in the knowledge involved will create more involvement of all parties.

Training people on the new way of working is very good. However, just providing training will not do the job. The obtained knowledge will not stick if it is not imbedded in the whole innovation process. Therefore the training should be well timed. Preferably the training should not be the first encounter with the innovation process. Rather, the planners should have already reflected on their way of working before the training, for instance when the inventory is made in preparation of the implementation process. Then, the obtained knowledge should be used and communicated. Have planners practice together in making the duty roster with the new software.

We want to conclude this thesis elaborating on the use of the cognitive semiotic model that we presented.

10.4 Elaboration of thoughts

10.4.1 The I-Space model and the cognitive-semiotic model

A main difference between the I-Space model and the cognitive semiotic model is the different focus of aggregation level. Whereas the I-Space model focuses on the organizational level the cognitive semiotic model focuses on the individual level. We argue that our model therefore provides an extra. Determining the knowledge of an individual implies determining part of the organizational knowledge. So determining the knowledge of many individuals implies the determination of a [big] part of the organization. This can be considered organizational knowledge. So, the step from individual knowledge to organizational knowledge is not a big step. Furthermore, determining the knowledge of individuals gives insight into the diversity of the knowledge available within the organization. Hence, it is very unlikely that all persons within an organization have the same type of knowledge, for instance, very codified and concrete. Rather, these persons all have different knowledge type patterns. For
instance, person A has strongly coded and rough sensory knowledge while person B has abstract theoretical knowledge and detailed sensory knowledge. By differentiating between the different persons within an organization will do more justice on the knowledge available within an organization. And more importantly, it will increase the use of the knowledge repository.

10.4.2 Other types of innovation

In exploring the value of our cognitive semiotic model we want to consider a different kind of innovation, the innovation within the organization itself, for instance, product innovation. Organizational innovation, such as the implementation of decision support, involves the input of something new into an organization. Innovation within the organization itself, on the other hand, relies directly on change that is realized by the members of the organization, which is the case in product innovation or service innovation.

Using the cognitive-semiotic model to understand the process of product innovation poses some challenging issues. First of all, we cannot compare the knowledge of the product before it was there to the knowledge of the product after it has been developed. So we need to establish what knowledge we consider in terms of dynamics. Secondly, product innovation involves people from different disciplines. So when we consider their knowledge dynamics, which knowledge do we consider? And thirdly, what kinds of expectations do we have for this diverse group of people working on product innovation in terms of knowledge dynamics? Can we understand the process and the activities of product innovation in terms of a general model on knowledge dynamics? So we are mainly looking for a reference point to be able to establish the knowledge dynamics.

Starting with the second issue, the different disciplines, this relates to the diversity of the group of people involved. The people that work on product innovation all have their expertise, which they use as input for the development of new products. In understanding the knowledge dynamics of the different experts we need to focus on the expert knowledge in relation to the new product, not their expert knowledge in general. Furthermore, we make the assumption that the process of product innovation does have a focus and direction. So when we want to study the knowledge dynamics of the experts involved we use the focus and direction of the new product as a reference point. For instance, the expert working on new ways to make coffee has the direction and focus of developing a
coffee machine or at least think about the ways to enjoy drinking coffee, either at home or in a public place. The knowledge [dynamics] that we consider in this process involves conceptual change of the new product. We could hypothesize that the knowledge type at the beginning of the process is primarily sensory, and gradually becomes coded. In communication with other experts the knowledge will become of a more theoretical nature. This line of arguing shows great parallels with the Nonaka and Takeuchi [1995] story on the development of new products, such as cars and bread making machines. The difference between their approach to knowledge change and our cognitive semiotic approach is that we explicitly add a theoretical dimension in the process of knowledge dynamics. This dimension is often implicitly meant in the more common term ‘tacit knowledge’ [see chapter 4].

Furthermore, we can expect that the role of theoretical knowledge is considerable. The experts are involved, as they understand their discipline in a broad sense. They are expected to be able to link their expertise to many different ideas and concepts and they are expected to be able to consider different points of view, which is an essential part of theoretical knowledge. We argue that theoretical knowledge is an essential part of product innovation and creativity in general as it provides powerful tools to perceive new things; and perception of change is what sets the process of knowledge dynamics in motion.