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Managing tacit and explicit knowledge in organisational teams

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Abstract

In this article we analyse how tacit and explicit knowledge are managed in teams. Tacit knowledge is located in human persons and it can not be described formally as data or any other form while explicit knowledge is public and formal. Our approach is qualitative and we aim to describe the appearance and behaviour of knowledge. We also aim to analyse the difference between tacit and explicit knowledge that is realised for example when transferring knowledge between actors in organisations and teams.

1. Introduction

In this article we tend to find out how knowledge is managed in teams. Among other things, knowledge can be found in relationships between people, processes, organisational memories and products.

As knowledge appears in so many forms and elements, it is important to understand its nature and value, not to forget its maintenance and transfer. In order to be re-used, knowledge must be stored and transferred for instance in organisational memory. Furthermore, acquiring organisational memory includes acquiring and using knowledge [4].

Traditionally, knowledge is described hierarchically with the concepts of data, information and knowledge. Knowledge is described as state of mind, object, process, prerequisite of accessing information and skill. At the same time, knowledge is classified by different types as tacit, explicit, cultural, functional, conceptual, embedded, individual, social, declarative, processual, causal, conditional, relational and pragmatic [1,2,3,6.]

As seen above, knowledge is an ambiguous concept and it is not axiomatic how knowledge should be managed. We tend to find out how knowledge is understood in the literature. We focus on tacit knowledge and explicit knowledge and try to find out how they are related with each other. We also highlight the challenges when transferring knowledge between its owners – whether it is organisation, people, process

or even product. All storages – man-made databases, online data sources, emails – are explicit knowledge which is created from tacit knowledge [15,16]. Walsham [16] notes that the storages are not useful to other people if the storages are not connected well to the tacit knowledge of the user.

Our approach is conceptual-theoretical and we complete the approach with a case study where the core issue is the challenge to transfer knowledge between actors in a team.

2. Literature review

In this section we take a closer look at knowledge and its different dimensions. Knowledge is not a commodity or a quantifiable asset. Instead, knowledge is such a concept that it has concerned philosophers for thousands of years [16].

A great deal of emphasis is given in order to understand the difference between data, information and knowledge. Because knowledge is personalised, it should be expressed in such a manner that it is interpretable by its receivers. Otherwise individuals' and groups' knowledge is not useful for others. Furthermore, arsenals of information are of little value as such - only actively processed information can be useful. The process must take place in the minds of individuals through a process of reflection, enlightenment or learning [1.]

Managing knowledge is understood to be so important that there are information systems specified to support and enhance the organisational processes of knowledge creation, knowledge storage and retrieval, transfer and application. Those systems make it possible to find recorded source of knowledge using online directories and searching databases or enable sharing knowledge and working in virtual teams [1.]

2.1 SECI

Next, we look at a model that is one of the central models describing knowledge creation and transfer, namely SECI (Socialisation, Externalisation,

Combination, Internalisation) –model. Interaction between tacit and explicit knowledge leads to the creation of new knowledge. The creation of tacit and explicit knowledge is affected by processes of socialisation, externalisation, combination and internalisation [9.]

Socialisation is about sharing experiences. New tacit information is created by shared experience in social interaction. It is essential that individuals overcome their existential limits and that they emphasise with their colleagues or other members in the group. Tacit knowledge, such as mental models and technical skills, can be achieved by spending time in a joint environment and without using any language by observing, imitating and practising [9,10.]

In externalisation tacit knowledge is expressed by concepts as metaphors, analogies, hypotheses and models. Tacit knowledge is made explicit so that it can be shared with others to be used as a base for new knowledge. Dialog is a good tool to transfer knowledge to others. Dialog between individuals is used when solving conflicts between tacit knowledge and surrounding context or between several people. It is essential that actors consciously break out from the context and routines in order to see the deeper conflict in the tacit knowledge [9,10.]

In combining explicit knowledge on concepts is organised as a knowledge system by combining different wholenesses. Explicit knowledge is transferred and disseminated with documents, meetings, email and telephone meetings. When knowledge is categorised, it may lead to the creation of new knowledge. The use of networks and huge databases may support this knowledge process. Conflicts are solved by logic instead of synthesis. New knowledge that is made by combining information in externalisation makes a group work together [9,10.]

In internalisation explicit knowledge that is created and shared in organisation converts into tacit knowledge in individuals. In internalisation process individuals reflect by putting themselves into the context of newly gained knowledge and its context and environment where the new knowledge should be used. The new knowledge is used in practical situations and it forms a basis for new routines. Explicit information should be used through action, practice and contemplation before it comes part of individual knowledge. In this way, internalisation process reminds learning by doing [9,10.]

Despite the physical form of the SECI model, Nonaka and Toyama [10] emphasise that knowledge creation and transfer through these four processes form a spiral, not a circle. The interaction between tacit knowledge and explicit knowledge sharpens when it takes place in these four processes in the expanding

spiral of knowledge creation. When knowledge is created in the process, it can trigger a spiral of new knowledge creation and the spiral expands both horizontally and vertically when it passes communities in interaction. Thus, creating knowledge can overcome organisational borders. New knowledge can be born when organisations are interacting. It is an ever-lasting process that updates itself continuously [9,10.]

2.2 CIP

We may then ask how knowledge is created and transferred in a group. To answer that question, we look at a model that supports collective information processing [12]. There are four phases in the model:

1. individual knowledge basis that comes along with the individuals in the group
2. collective group knowledge basis that forms when the individual knowledge is conceptually overlapped
3. communicated knowledge basis that necessitates interaction between seeking, saving and browsing collective information and evaluating and using it
4. final information database that enables a final conception of knowledge via earlier phases.

The processing of knowledge takes place in social interaction to be used in decision making by looking for information, storing and searching information, and evaluating and using information. First, phase 1, the individuals enter the group. The interaction in the group is dependent on the availability, knowledge load, redundancy and access of individual knowledge. Individual knowledge can be shared or non-shared. Second, phase 2, individual knowledge appears overlapping. Collective information processing (CIP) is influenced by, for example, the size of the group, individual status and presuppositions of how parallel individual concepts in the group are. Transferring knowledge is perceived more difficult in big groups than in small groups. Third, phase 3, communicated knowledge basis forms in interaction. Earlier phases with their knowledge base influence the amount and quality of the communicated knowledge. The functional environment of the group builds the context for the interaction and thus it affects the knowledge base and its creation, too. Fourth, phase 4, the final information basis is formed and it is influenced, for example, by earlier phases and the nature of individual knowledge, group characteristics and the role of communication in processing collective information. It is possible that part of the knowledge owned by the group members is still hidden, not to forget the possibility of false information or its improper use [12.]

According to SECI-model [9], interaction between tacit and explicit knowledge leads to the creation of new knowledge. CIP-model introduced by Propp [12] describes how knowledge is formed in a group. Next, we try to contemplate the mechanisms that may assist in creating knowledge.

2.3 Ba

Ba is a Japanese concept introduced by Nonaka and Toyama [10] and they describe it as a mechanism that must be ever again created. This mechanism explains possibilities and dispositions that either inhibit or stimulate functions of creating knowledge. The mechanisms of ba that enable interaction between people can be physical (physical ba) as a meeting room or virtual (virtual ba) as email and even mental (existential ba) as private emotions, shared experiences and mental models. These different ba's form a basis for creating knowledge and transferring it [7,8.]

Instead of being a model of organising, ba is a way of organising and it grounds on the purpose that ba tends to create. A firm can be seen as an organic configuration that consists of several ba's where people interact with each other and their environment. People act in ba on the basis of their knowledge and new knowledge that will be created. In a sense, ba is a place where knowledge is created. Ba is not a fixed organisational structure; instead, people come and go in ba [10.]

To be created, active ba needs contradictions, several conflicts, shared context and participants capable of dialectic thinking and actions when combining the contradictions. Ba is not closed because all necessary contexts must be let in but despite that, ba must be sheltered from outside contexts that its own context can evolve. A good ba gives the actors possibilities to get rid of their daily routines and to externalise their individual knowledge [10.]

3. Research path

This study is descriptive, qualitative and conceptual-theoretical in its nature and we tend to get a clear picture of the research area.

The study was mainly carried out by conceptual-theoretical research. A systematic review [5] was carried out, that is, all available research relevant to the topic area was analysed. First, when planning the review the need for a review was identified and the review protocol was developed. Second, research was identified, primary studies were selected, study quality was assessed, data was extracted and monitored and

finally data was synthesised. Third, primary studies were governed by inclusion and exclusion criteria.

In addition to conceptual-theoretical study, we used the means of case study [14,17] to get empirical data in our study. The case was about a team that had to share knowledge regarding the activities carried out by it.

The means of content analysis was used when analysing the empirical material in this study. Analysing texts and documents may appear as discourse analysis and thus they are interpreted by the analysts [13]. We approached written texts as they are and classified them according to their themes, content and writers.

4. The empirical case

In this section we introduce the empirical material that was collected by a member in a computer support service. The service team consisted of three members and it acted in an administrative office of a public organisation. The team members followed shift work; however, no night work was needed. In turn, every member acted as a person in charge and this way nobody was permanently higher in rank than others in the team. The team gave services such as procurement of joint hardware, premises, software, maintenance and development, user administration in the intranet, teaching, support and advice. Thus, the activities were versatile and due to the amount of workstations (370), not to forget the software that needed updating, the need to share information in the team was urgent.

Due to the ever more complicated tasks and the greater amount of events and incidents, the need to store, share, find and transfer internal knowledge in the team came essential. With the time, the amount of emails and hardware had increased. Every now and then there were substitutes and trainees in the team and the need to transfer information was emphasised. The outsiders had to be familiarised quickly to the work and into the routines of the team.

The empirical material in this case was limited to team level emails and documents because we wanted to find out how knowledge is managed and transferred in a team. As there were also emails sent directly between team members we only include individual emails from one member. That choice is reasonable because it was a custom to forward the emails to each other.

We also had to limit the number of emails that were analysed and finally we analysed 161 team-based emails instead of 1765, 419 individual-based emails instead of 7923, and 1153 documents instead of 4033. In addition, there were lots of documents in paper forms stored in folders concerning licences, equipment

maintenance and teaching. Two folders were analysed thoroughly because they were central in the daily functions of the team. Only documents and folders that were not actively used were excluded from this study. However, these numbers display the huge amount of written interaction that was carried out in seven years (2001 – 2007).

First, the empirical material was differentiated by the ways of knowledge transfer and knowledge storage that were a central part in the team's actions. The chosen material was read thoroughly several times. After that, the material was themed and typical cases were found. Excel-table was used when analysing the material, thus supporting also in quantifying the material. Theoretical framework was used when analysing the empirical material.

Based on the model (SECI) developed by Nonaka and Takeuchi [9] we sought out signs of socialisation process, externalisation process, combination process and internalising process. From the socialisation process we analysed if there were signs of bystanders or working together in a same space or acting like an apprentice. From the externalisation process we analysed if there were signs of using metaphors, analogies or models that were shared by using dialog. We also explored if there were willingness to share tacit knowledge between the members. From the combination process approach we found out if knowledge was transferred by documents, meetings, email or by telephone. Likewise, we wanted to find out if knowledge was categorised and if it was combined. From the internalisation process view we explored if individual reflection was seen in any way in the empirical material. We were interested to know if there were any knowledge storages in the material.

By using CIP model [12] we analysed how the team used knowledge. We analysed if there were signs of seeking individual and group-based information, if there were signs of communication when seeking information and if knowledge was searched from other members. From the point of information storing and searching, we groped for signs of recalling, constructing jointly knowledge and making faulty interpretations.

An important research topic was to find out how knowledge had been stored keeping in mind its reusability. We wanted to know if there were any signs of reusing knowledge and what was the group-based memory like. Moreover, we wanted to know if context was stored and if so, how was it seen and how was context-based knowledge transferred. We also explored if documents made by other members were used and how it was done.

Furthermore, we studied factors that either supported or inhibited transferring knowledge. We

wanted to know if there were any communication that either benefited or restrained communication and if there were any model-driven individual or group-based factors that influenced knowledge transfer. Especially we wanted to find informal knowledge transfer in the empirical material.

5. Discussion

In this section we discuss the results that were found in our empirical case. We write out the situations and also point out some references to the theoretical background.

According to ba [10], knowledge is created with the help of virtual ba, physical ba, existential ba and shared context added with individual context.

The team used several ways when transferring knowledge to each other. Information was transferred by phone, face-to-face at coffee table and corridors, not to mention ad hoc meetings. Due to the need to maintain the greater hardware and equipment, the team had less time and occasions to meet each other face-to-face. Therefore written notes were used that were available and stored in joint disc space. In addition, documentation about hardware, equipment and their service operations was stored in the joint disc space. Information about mounting and maintenance was saved in paper form, like workstations' rental agreements and other protocols.

The state of task lists was often checked from the joint email. Knowledge was acquired by every team member independently in emails, private workstations and by tasks that were managed independently. The documents and emails were used when knowledge was transferred from one person to another and they also supported memory (cf. physical ba and virtual ba, [10]). With these tools, knowledge was transferred by time. Knowledge was hidden also in processes or it was not found if hidden in processes that were not used by the team.

Knowledge had to be found and transferred from one person to another ever more and quicker. Likewise the members had to be able to store knowledge on different occasions, events and equipments. For example, what has been done with the equipment or what kind of actions had been managed with other people, outside of the team. There was no time to transfer information face-to-face and there was no arranged way of how to document sporadic or individual tasks to each other. Therefore, there were situations when a task was managed twice and other tasks were left to wait for service for a long time. In addition, it was time consuming to find out if somebody already had done something. Furthermore, it

was annoying to know that something was already done but nobody knew where the information about that something was.

... well, yes, I had made a document about that to the folder called "Guidelines to Users" ... but I didn't remember even that ...

In both SECI and CIP model the context is found significant [9,12]. Our team tried to help other members to understand the context by classifying the documents, files and emails in separate folders. The folders described the task or context where they were created or where they were thought to be used later. The folder demonstrated the context that was to be used when seeking knowledge. It also acted as a context when interpreting the content of the documents. The structure of the folders has lived during the passed years and that was seen for example in the names of the folders and notes that discussed the names.

There were also issues that only one member was aware of. Therefore the information was impossible to access if the member was away (cf. individual knowledge base, [12]). This kind of tacit knowledge was perceived problematic. The problem was discussed in the team meetings and it was marked in the meeting protocols, too:

... to support documentation and team-based information transfer we'll start weekly documentation meetings when we'll discuss all events and tasks through.

... every issue that may influence other's work should be emailed to colleagues.

There were tasks that formed a completeness related to the team or to a member of the team. From the material, there were signs of transferring knowledge between those tasks (cf. phases 1 and 2). Next, we introduce some knowledge creation and knowledge transfer that is related to these tasks.

The team did scheduled maintenances to the workstations. Every time the actions were documented and the documents were stored in a folder. Sometimes the members did notes in advance if the workstations needed actions that were not pure routine. This information was sometimes transferred by email, as well. The maintenance process included characteristics from SECI [9] where the socialisation process means a process with sharing experiences. The maintenance was carried out in a shared space and the members tended to work together and discuss the actions. Somebody made notes of the actions. These notes also served when transferring experience-based knowledge and the members tried to support each other by writing additional notices:

Make sure that the virus elimination starts automatically – there are problems in protection ...

Some members might know issues received directly from the customers and the issued influenced the current task. Therefore the members commented the task at hand. It happened that the planned maintenance was changed due to the shared knowledge. Here, also externalisation process was seen in the team because tacit knowledge was made explicit so that it was transferred to other members to be used as a base of new knowledge in the mode of concepts, pictured and written documents. The maintenance document acted when transferring knowledge both in the team and from time to time [1].

It also happened that the team used outside source when solving a problem, for example www-site or other document of a vendor or previously made team-based documents. When knowledge was organised from concepts to a system by combining several different totalities, it was a matter of combining process [9]. An example of creating new explicit knowledge out of combining process was a document that was done for a trainee. The document was done by combining, collecting and modifying several maintenance documents made by the team. The more experienced members had transferred their internal model of the maintenance to a visible mode and thus opened their individual concept of how tasks are related to be used by a new member.

In addition to the written guidelines, trainees were helped with tutoring in installing hardware. Sometimes it was no time to give advice long enough but the trainees had to interpret the documents written by the team. The documents were interpreted with the help of the trainees' experience. Thus, the trainees reflected in their internalising process in the newly acquired knowledge in the context and environment where new knowledge had to be used (cf. SECI, [11]). Without previous experience and if the guide was lacking, the trainees tried to install the machines according to their own thoughts. Afterwards the trainees modified the knowledge and continued with given advice. With the progress of installing the workstation the trainees used explicit knowledge through action, practice and contemplation, and thus explicit knowledge turned into a part of the knowledge (cf. SECI, [11]).

In all, one can conclude that it is not self-evident how knowledge is managed in teams. Despite that, knowledge should be stored and transferred in such a way that it can be used also by others that its producers.

6. Conclusion

In our case we introduced a small team and focused on emails and documents that were transferred in the

team. The written documents represent the way how explicit knowledge was shared, stored and transferred in the team. In addition to explicit knowledge, tacit knowledge was to be transferred as well. The team was not able to find any new way how to transfer or store tacit knowledge. However, they used the traditional ways to add information to formal documents. They pasted post-it-notes or used coloured markings when emphasising some essential points in the information and in this way they pointed out that there is something else in the documents, as well.

Our empirical case shows that knowledge really is transferred, stored and created based on earlier knowledge. This transferring, storing and creating takes place in our every-day live and we do not always even realise its value and importance. Our case as well as the literature emphasises interaction between actors. Active and deep interaction is the most common way and place where tacit knowledge can be shared and transferred. We can support it by giving possibilities to interaction and we should not forget the need for free and informal events and occasions. The small team suffered because they had no time to meet each other face-to-face as they used to. The team members felt that due to increased hurry and lack of time inhibited knowledge transfer. These observations verify earlier research that emphasises the need to hang around and thus enable socialisation process, externalisation process, combining process and internalising process take place.

Our empirical study leads us to think how everyday knowledge is stored in our community and how we can enable other people to benefit from it. No knowledge is valuable if nobody can use it [16]. It would be interesting to investigate how other small organisations manage the challenges to transfer tacit knowledge. Do they use post-it-notes or do they mark documents with colour pens when they want to emphasise additional knowledge..

8. References

- [1] Alavi, M., and D.E. Leidner, "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues", *MIS Quarterly*, 2001, 25, pp. 107-136.
- [2] Blackler, F., Knowledge, knowledge work and organizations: An overview and interpretation. In: C.W. Choo, N. Bontis (Eds.), *The Strategic Management of Intellectual Capital and Organizational Knowledge*, Oxford University Press, New York, 1995.
- [3] Choo, C.W., *The knowing organization: How organizations use information to construct meaning, create knowledge, and make decisions*. Oxford University Press, New York, 1998.
- [4] Huysman, M.H., S.J. Fisher, and M.S. Heng., "An organizational learning perspective on information systems planning", *Journal of Strategic Information Systems*, 1994, 3, pp. 165-177.
- [5] Kitchenham, B, "Procedures for Performing Systematic Reviews", Keele University Technical Report TR/SE-0401 and NICTA Technical Report 0400011T.1, July, 2004.
- [6] Nonaka, I. "A dynamic theory of organizational knowledge creation", *Organization Science* 1994, 5, pp. 14-37.
- [7] Nonaka, I., and N. Konno, "The concept of "Ba": Building foundation for knowledge creation", *California Management Review* 1998, 40, pp. 40-54.
- [8] Nonaka, I., P. Reinmoeller, and D. Senoo, "Management focus, The 'ART' of knowledge: Systems to capitalize on market knowledge", *European Management Journal*, 1998, 16, pp. 673-684.
- [9] Nonaka, I., and H. Takeuchi, *The knowledge-creating company – How japanese companies created the dynamics of innovation*. Oxford University Press, Oxford, 1995.
- [10] Nonaka, I., and R. Toyama, "The knowledge-creating theory revisited: knowledge creation as a synthesizing process", *Knowledge Management Research & Practice*, 2003, 1, pp. 2-10.
- [11] Nonaka, I., R. Toyama, and N. Konno, "SECI, Ba and leadership: A unified model of dynamic knowledge creation", *Long Range Planning*, 2000, 33, pp. 5-34.
- [12] Propp, K.M. Collective information processing in groups. In: Frey, L.R, Gouran, D.S. & Poole, M.C. (eds.) *The handbook of group communication theory & research*. Sage Publication, Inc. Thousand Oaks, 1999.
- [13] Silverman, D. Analyzing talk and text. In: Denzin, N.K. & Lincoln, Y.S. (eds.) *Handbook of qualitative research*. Sage Publications, Inc. Thousand Oaks, 2000.
- [14] Stake, R.D. Case study. In: Denzin, N.K. & Lincoln, Y.S. (eds.) *Handbook of qualitative research*. Sage Publications, Inc. Thousand Oaks, 2000.
- [15] Topi, H., W. Lucas, and T. Babaian, "Using informal notes for sharing corporate technology know-how", *European Journal of Information Systems*, 2006, 15, pp. 486-499.
- [16] Walsham, G. "Knowledge Management: The Benefits and Limitations of Computer Systems", *European Management Journal*, 2001, 19, pp. 599-608.
- [17] Yin, R.K. *Case Study Research. Design and Methods*. Third Edition. London: SAGE Publications. 2003.