



**ACCELERATING THE NEW PRODUCT
DEVELOPMENT PROCESS:
PROJECT-CENTERED KNOWLEDGE
MANAGEMENT AT ROCHE DIAGNOSTICS**

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1. BACKGROUND

1.1 AUTHOR

Dr. Pavel Kraus was holding the position of Knowledge Networking Officer at Roche Diagnostics between 1998 and 2000. His assignment was to develop a global specific knowledge management (KM) strategy and to prove the practicability of the concept with specific knowledge management projects.

1.2 CONTEXT OF THIS CASE STUDY

This case describes activities of the knowledge management initiative at Roche Diagnostics in 1999. After the merger of former Roche Diagnostics and Boehringer Mannheim a new global player was created in the in-vitro diagnostic industry. Prior to introducing a global knowledge management program, first practical cases had to demonstrate the value of the knowledge management concept.

The former CEO Jean-Luc Béllingard has directed the KM activities towards R&D and more specifically towards new product development.

1.3 AIMS AND TARGET GROUP

To recognize the leverage and proper place for practical translation of knowledge management activities within an organization. To identify how result oriented knowledge management has to be integrated into business processes.



2. CURRENT SITUATION

Tom Brown was flying from US into Frankfurt. During the flight he has contemplated his new assignment which he received just a few days ago. The business unit where he has held the position of an IT innovation leader was developing several lines of small hand held devices for glucose measurement. People with diabetes were using these small computers for managing their disease.

In the course of time the company has developed several lines of these meters. Most of the products were developed with a unique idea in mind for a specific need of the patients. Thus although each was performing the same basic functions, they differed in many ways how to perform these functions. Since each of the product lines had its own schedules, some tasks were done without considering benefits of working together. Thus the teams were reinventing the wheel.

Tom's new assignment was to gather the project leaders of the various product lines in a special task force to discover and realize synergies among the various products. What was difficult about his tasks was that he had to orchestrate work with people who each were in charge of a project with tight timelines. Tom's project had an impact on everyone, but no one could afford to fall behind its own schedule.

On the other hand, given that Tom's project was successful the company's savings could run into a double-digit million dollar amount per year and the management was eager to save this money.

Tom knew where he would find help. The company was currently investigating the promises of knowledge management. An internal consultant, Peter, was introducing various knowledge management methods to make business processes more efficient. To meet this person was the goal of this trip.

After quickly glancing through the airplane window Tom turned to this notepad. He jotted down the issues he was facing:

- Fast project kick-off with sustainable results
 - Creating a buy-in of the team in terms of goal recognition
 - Accessing information and knowledge of the team
 - Shared understanding of priorities and project flow
 - Agreeing on detailed action plans
- Timely communication and information exchange
 - Precise communication at meetings
 - Creating common language across the various disciplines
 - Usage of electronic team-room as communication platform
- Avoiding information overload in complex project phases
 - Merging information among parallel working teams
 - Fast decision making

Tom needed to start the project fast and he knew, the other project leaders had very busy schedules as always. Tom could not burden them with long preparations or additional homework, so the team sessions had to be organized in a way to complete lot of work in a very efficient manner.

One half of the team resided in the US, the other in Germany. Thus, he had to concentrate on a few, but well organized workshops with good exchange of information. The mutual access to information and knowledge of the other team members was the key for a fast project pace.

Tom contemplated which communication pathways and standards he should employ for his project. Timely communication and methods of information transfer and access are of the utmost importance in successful projects. This is true for synchronous communication during events as well as asynchronous exchange through an electronic platform.

Another area of concern was document standards. Tom had learned during his many years of experience how the generation, structuring and use of documents could either help or hinder a project. For this project he wanted to further improve the already good standards.

For an efficient exchange of information across the Atlantic, Tom needed the help of Walter. Walter was in charge of the project team room on the intranet. This team room had recently been created out of two different systems. One was a document management system, the other a higher-level management information system. Walter was in the course to merge these systems with the goal to improve the service for the project teams.

It was necessary that after Tom's team was formed, it must have the power and capability to make timely decisions. Such an empowered team is able to face issues and obstacles and make decisions without having to wait for higher-level feedback.

A further issue was the timing of certain decisions within one of the involved project teams. This team was about to complete a key first milestone in the development of a new meter. They had to take certain decisions based on one year of development work. This very complex undertaking was planned for the next few days. The decisions taken by this team had direct impact on the timing of Tom's assignment.

Tom was also concerned about the term knowledge management. In the past there had been already a few projects in the organization with this label. One had focused on coordinating collaboration with external partners, another one on avoiding duplications in acquiring business reports and the last one on setting up yellow pages with skills of employees. The core idea of all of these projects was a central database. None of these projects had the desired impact on the business results and Tom was eager to understand why this was the case.

Another issue was how to integrate the new ideas from the knowledge management arena into the daily work of the staff. There was no time to spare for courses or education. Tom needed ready made techniques that help to drive his project faster and more efficient.

GOALS OF THE ROCHE DIAGNOSTICS KM INITIATIVE

On the outset of the new KM initiative stood an analysis of the business areas where knowledge management could deliver the greatest leverage. This analysis was done using the knowledge intensity and process complexity parameters as developed by Eppler¹ et al.

Tom's challenging assignment fitted exactly into the framework of the knowledge management effort of the company. The main focus of the KM initiative was to improve processes within the new product development. The goals given by the CEO and R&D management were as follows:

¹ Eppler, M. and ...

1. Improving the development parameters; mainly time to market, but also post launch quality (measured in MTBF), stable supply of products after the launch (measured in stock-out days), cost within the agreed frame or lower, and features in agreement with the original plan.
2. To provide tools that allow earlier access to a broader base of information, which improves the quality and timing of decisions.
3. To help to reduce personal stress and increase job satisfaction among team members, which helps to lessen contention between projects, team members, and company sites.

Having described the major goals of the knowledge management project and the personal context of Tom (the operational development project head) and Peter (the knowledge management coach) we can now look at the larger context for the two: the company's situation at this point in time.

3. BUSINESS CONTEXT

Roche Diagnostics is a leading healthcare company with several operational units and globally distributed research and development units. The teams are working within a research-intensive environment. They have many contacts to RD external partners, such as universities or start-up companies.

In 1998 Roche Diagnostics has organized its activities in four business areas: Roche Molecular Biochemicals, Roche Molecular Systems, Roche Laboratory Systems und Roche Patient Care.

Roche Molecular Biochemicals is a producer of research reagents and systems for the advancement of medical science and the use in industry. They support life sciences for the development of early diagnostic and therapeutic applications.

The products of Roche Laboratory Systems und Roche Molecular Systems include instruments and reagent kits for Immunochemistry, Clinical Chemistry, Serum Work Area, Coagulation, and Hematology. Additionally, they offer consulting and services in laboratory automation, and laboratory IT-Systems.

Roche Patient Care offers a range of products to doctors and patients for decentralized professional testing and patient self-monitoring. Besides diagnostic tools such as portable blood gas analyzers, blood glucose and coagulation meters and test strips, they offer comprehensive IT-based education and training materials.

The sales of the diagnostic division were US\$3.8 billion in 2000. The number of employees was 15'600.

NEW PRODUCT DEVELOPMENT AT ROCHE DIAGNOSTICS

New product development is done at Roche Diagnostics by interdisciplinary teams that are working mainly in Germany and USA. They belong to the business processes with one of the highest process complexity and knowledge intensity. These processes have been well described for quality and regulatory reasons. Compared to well defined procedures such as order processing, product development is a much more complex process. This has been also described by Eppler et al. (1999) as seen in the graph below.

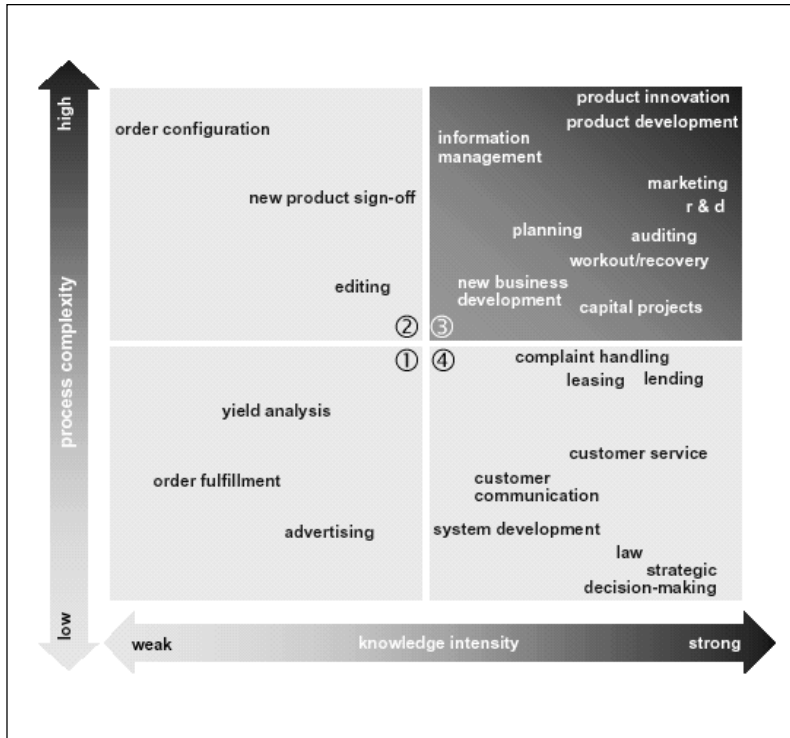


Figure 1 ■
Classification of business processes in regard to process complexity and knowledge intensity.

At the start of the KM initiative every process step of the new product development process has been analyzed by experienced project leaders. The process steps with the highest process complexity and knowledge intensity have been identified.

The KM initiative was designed to focus on these very steps. For this reason knowledge management can create a higher leverage than in any other process, and therefore deliver a high return on investment.

H 4. KNOWLEDGE MANAGEMENT MEASURES AND RESULTS

In their meeting Peter and Tom have discussed what has been happening in the knowledge management arena so far and what Peter's current approach to knowledge management is.

Unquestionably access to knowledge of individuals and the sharing of information across geographical and hierarchical boundaries has been an issue at Roche Diagnostics (formerly Boehringer Mannheim) for many years, as it was and is in many international companies. In various projects one started to make attempts to link dispersed information pieces, for example in the area of business information and in research and development.

Peter told Tom that there have been cases in the past, when teams independently picked a similar research topic and without knowing about each other worked on it for several months. After this preparatory period all four have identified by chance the same external partner company and paid visit to it. When the last group arrived at this company, they were presented with the business cards of all the three precedent teams. They were asked if they did not know that their colleagues had been working on the same topics.

Similar redundant work was identified in a different part of the organization, namely in the purchasing processes for market information. Many market research companies are selling the same reports many times to one and the same client. This is possible because the buying departments are not aware that the same report has been purchased already.

The third area was the creation of Yellow Pages. The company wanted to increase access to the skills of the employees. The internal knowledge should be shared better and used more efficiently. This idea is an old goal from the first days of knowledge management endeavors. To enable sharing of knowledge and expertise across organizational boundaries is unquestionably a pressing need for many companies.

However, the solution to these and other similar problems was originally thought to be in creating various central databases. Everybody having special skills, particular know-how or was working on scientific projects with contacts to external partners, was supposed to submit their data, in order to create visibility for others. In this way, it was thought, duplications could be prevented.

Unfortunately, after these databases were built, a mechanism started to play, which Romhardt² calls the 'death spiral' of an electronic database. The use of the system goes down after an initial big effort took place to feed that database. As time goes by, the quality of the data gets worse. People stop trusting the data as it gets outdated and this again has a negative influence on the use of the system. The vicious circle is closed.

² Romhardt, K., ...

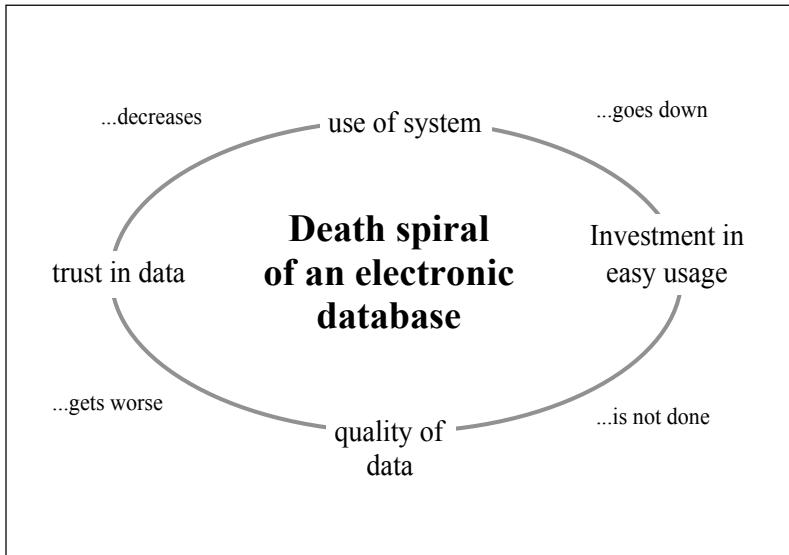


Figure 2 ■
Death spiral
of an electronic
database
(K.Romhardt)

In order to break such a vicious circle one has at least two possibilities. Either one tries to push the usage of the system by clever marketing or one analyses the business processes and makes the system an integral part of the work process.

The marketing efforts require glossy brochures, posters in meeting rooms and personal presence of the promoter with users. One can place the database on a prominent place in the intranet. However, users still can do the necessary work circumventing the system. Thus, they perceive the system as an add-on-work and it becomes a burden.

At Roche Diagnostics the experience showed that several similar systems had a life independent of the business processes with the corresponding effect of high promotion efforts being necessary to keep them alive.

ACTION LEARNING AS A PROJECT PHILOSOPHY FOR IMPLEMENTING KNOWLEDGE MANAGEMENT

After this discussion of the past Peter explained to Tom his knowledge management philosophy. First, a proper business process analysis is a prerequisite for a successful implementation. This analysis has to clearly distinguish between information and knowledge processes. Second, knowledge management should focus only on practical deployment of special techniques and methods with the goal of increasing effectiveness, and third, these activities must be seamlessly integrated into the daily work of the people.

The standard approach for educating teams is to offer a selection of training courses. Such are e.g. project management, team building, conducting meetings, time management and others. During these courses the team usually leaves the actual work, receives the training and returns with new ideas to the workbench. Often the implementation resolutions of the new ideas evaporate in the daily business. This classical education scheme is depicted in the graph below.

A different approach has been taken by Peter's KM initiative. New KM techniques were deployed to the team while keeping working at their issues. This simultaneous training and implementing has several advantages:

- It enables the team to accelerate their project, using new methods immediately
- It improves the learning quality, as actual work gets done
- The KM theory is not taught, but immediately turned into action

The integration of KM measures into the work process is depicted in the graph below:

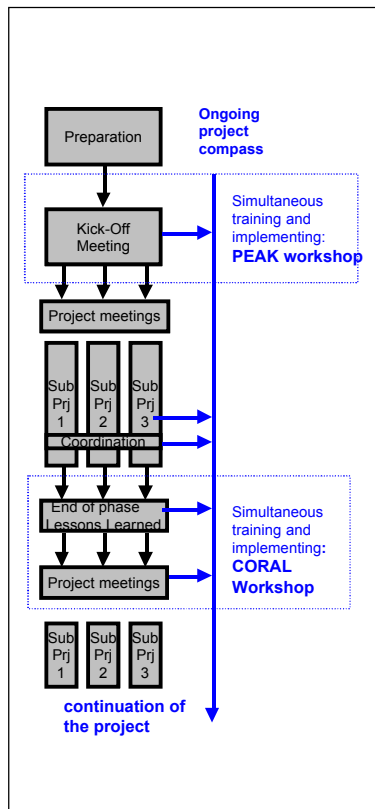
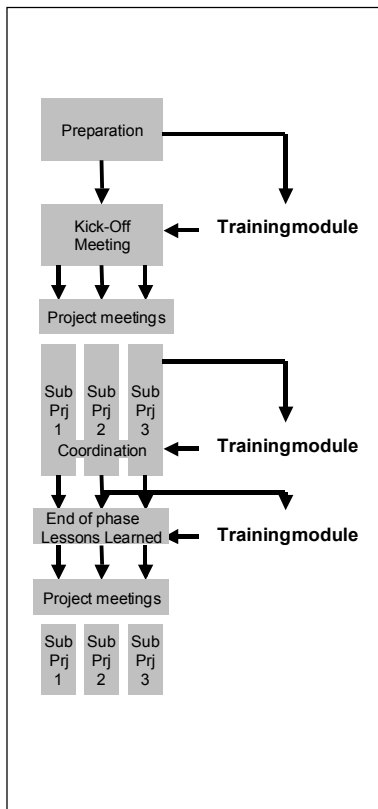


Figure 3 ■
(left)

**Classical
education
scheme**

Figure 34 ■
(right)

**Process
integrated
KM modules
(action
learning)**

This type of knowledge management introduction and simultaneous implementation follows the so-called action learning principle. It is similar to learning on the job. New techniques and knowledge management methods are introduced as one moves along with the project.

Thus, action learning allows for an integration of knowledge management activities into the actual business processes, as depicted in the diagram above.

After this discussion between Tom and Peter they had agreed to take the following approach.

The knowledge management measures would be directly incorporated into the team's work to enhance its productivity. There would be no training or learning sessions about knowledge management, but direct integration into the practical work.

This was one result of Peter's experience so far. Peter had reported to Tom that before starting the collaboration with another group, they were wondering in the first place, why they should lose time with something like knowledge management. Only after they agreed to one first KM module to be integrated into their project, they have realized, what this actually meant.

This module helped them to analyze their project from many angles within one single workshop. The completeness and efficiency was greater than anything they have known in the past, when similar project workshops were done without the knowledge management techniques. The outcome was so convincing that they continued with the KM support.

PHASE 1: FAST AND EFFICIENT START-UP FOR TOM'S STRATEGIC CROSS-FUNCTIONAL PROJECT

Tom's team would consist of international project leaders, each responsible for another product development project. Each of these projects had tight timelines to meet. Nevertheless Tom needed the cooperation of each of these project leaders and had to convince them to devote time to his assignment.

This strategic assignment had impact on each of the various products, but none of them should slip in its timeline. Some of the project leaders knew each other; others were new to the group. But they had to enter the project fast, coordinate their activities, and get mutual access to their knowledge and expertise.

Analysis of the issue:

A project start is usually done with some team building exercises. The team members learn to know each other and get familiar with the subject matter. Often one needs several such meetings to get really going. The people need time to develop a common language, get a common understanding of the project goal and to exchange information.

Often they do not realize that some information they possess could become a key input into the project work. They see this information in a different light or other team members do not describe this information in familiar terms to the owner. The result is that key information is not available to the team.

The project outline and the project steps had to be monitored and watched closely. Newcomers into the team had to be brought on board fast. There would be not time for a long learning curve. They would have to realize quickly which steps, events, documents and decisions have already been taken and what was still ahead.

In this case however, there was no time to loose. The project start had to be successful and what usually takes weeks of coordination activities had to happen in a few days. Therefore Tom needed a sophisticated knowledge management process to get the team acquainted with all the various aspects of the project.

Solution:

A successful kick-off for the project has been reached by employing the P.E.A.K. method. This method delivers a clear understanding of the project goals; the team members receive a systematic access to knowledge and information of the other team members. The team is lead systematically through all the knowledge needs and identifies and visualizes the knowledge gaps for meeting the project goals. Once the gaps are identified, measures for closing them are agreed upon. Further they identify the main critical points of the project, and finally achieve an agreed upon action plan.

During the two days the team gets synchronized in many ways. There is synchronization in understanding, language, and information about the project process.

Another two instruments helped Tom's team to stay on track. One was a project compass – a continuously developing project overview document. This document consisted of description of key goals of the project, contact list of all stakeholders, project history, key insights from the project and some other sections. The project compass has multiple purposes. Once it focuses teams thinking, helps to market the project internally, helps reminding the team members on the functions of their colleagues and thus facilitates easy access among them. If there would be changes in the team, the newcomers could grasp the path of the project fast and integrate quickly into the work.

What has helped to exchange the information generated within the team was the newly launched intranet platform. This platform was recently re-launched after an extensive review.

A human factors specialist has analyzed to which degree the platform was supporting the working processes. This analysis was the basis for a complete redesign. In addition, a new taxonomy for documents was created based on a synthesis of various naming systems used by the project team members. After the launch project team members stopped complaining of having difficulties finding information and making contributions.

By applying the P.E.A.K. method, the project compass and using the intranet platform Tom's assignment got well under way. The momentum gained during the initial workshop was sustained by watching the timelines within the action plan closely. The next step on the time critical path was a crucial input from another development team. This was his next concern.

PHASE 2: MANAGING OF STRATEGIC DECISIONS WITHIN A NEW PRODUCT DEVELOPMENT TEAM: AVOIDING INFORMATION OVERLOAD, EFFICIENT DISTILLATION OF KEY DECISIONS

Tom's assignment is time dependent on a key input from another development team. This team consists of about 20 researchers and engineers and also of marketing people. They have been working for one year to complete the first milestone of a new product. During this year they have accumulated piles of information from technology evaluations, laboratory results, chemical development.

The documentation of this phase runs several thousand pages long with various reports, business presentations, and laboratory journals. In order to prepare phase 2, this material has to be reviewed in a two-day workshop. This is the time when results have to be thoroughly thought through, their impact on the decisions evaluated and weighted against each other. A complex multi-dimensional decision matrix is needed to arrive at results at the end of the two days.

Go or no go decisions have to be taken at this workshop and Tom cannot afford any postponing of the decisions. A postponing of decisions in this team would have disastrous impact on his assignment time schedule.

Analysis of the issue:

Tom knew similar situations. The danger has always been to drown in a sea of details. To manage the information overload is often too difficult. The team tends to jump from one topic into the other, cannot well distinguish important details from unimportant. So there is no clear discussion process going on.

Solution:

The sub-project leaders on a specific agreed upon detail level have prepared the results of the various working teams. During their presentation visual minutes were taken online by a workshop assistant. Together with the main points also all questions and decision options were recorded. After the presentation, the visual minutes were shown to all participants and interactively corrected where needed.

This was done for every of the 11 working teams. At the end one had 11 visualizations of the various sessions. In this way the second condensation of the topics took place. The various inputs were weighted against each other. Because everybody discussed the points currently displayed on the screen the discussion was well structured and well guided.

In the next step the various visualization were condensed into one. This phase helped to merge various viewpoints. The decisions could be well prepared and the reasoning documented. This interactive documentation helped to arrive at decisions in a timely manner. One key element was the possibility to display the visual depiction of any kind of workshop discussion instantly. Thus the memory of the people was not burdened and they could concentrate only on the main decision criteria.

Peter was assisting this team to reach their goal within the given timeframe. He employed various techniques, among them group mind mapping within the workshop context. The personal face-to-face exchange of the developers combined with simultaneous knowledge documentation and visualization techniques proved to be the key success factors in this case.

PHASE 3: IMPROVING THE PROJECT WORK BY DEBRIEFING THE TEAM AND APPLYING THE LESSONS LEARNED FOR GREATER EFFICIENCY

After 3 months Tom's team has covered lot of ground. Most of the work was well identified and people were working on it. Besides the first successes there were misunderstandings and failures as well. Therefore Tom has decided to take the advice from Peter and run a newly developed lessons learned workshop.

Analysis of the issue:

In teamwork some things go well and others fail. Most often there is no systematic recording and assessment of these events. However, for a highly efficient team work this issue cannot be set aside. Singular successes or failures have to be systematically identified and analyzed. In the future, the conditions for successes should be repeated, those for failures avoided.

Solution:

A systematic one day project review and team debriefing was done using the C.O.R.A.L. methodology. The completeness of the work was checked, most important causes for successes and failures were identified.

The C.O.R.A.L. methodology helped to work out improvement measures for future work. The successful project steps were analyzed and the causes were made explicit. Thus they could be deliberately repeated. The way of working was improved in a similar fashion. Team communication and coordination needs were also reviewed and necessary improvements implemented.

This analysis has also revealed that the team has missed to identify a very important set of parameters. These parameters seemed to most of the members so self evident, that no time was devoted to this issue. During the C.O.R.A.L. workshop this shortcoming became very visible.

Since all of the experts needed to solve this issue were present during this workshop, Tom decided to address this task immediately. He was equipped to use some of the techniques from the previous phase at this time. This led to a detailed, but timely discussion of various aspects, that were key to the project. The completion of this work helped the team considerably to meet the overall project timeline. At the same time it again underlined the usefulness of the new knowledge management techniques.

5. IMPLEMENTATION PROBLEMS AND OPEN ISSUES

After the successful completion of the project Tom was once more engaged in a discussion with Peter about the lessons learned from his own project and some issues which he was worrying about.

By now he has well understood how direct knowledge management measures can improve the work of a team. The new techniques have improved the speed of the project and in his case made the project feasible in the first place.

ACCEPTANCE OF KM SUPPORT BY THE ORGANIZATION

However, the first issue was that knowledge management needs not only new techniques, but also trained people with specific roles and in addition support personnel. The understanding in the organization has still to grow to implement these measures on a broader basis.

PROFESSIONAL FACILITATION SUPPORT

The second issue was the availability of professional moderators to support product development teams. The quality of the project work has improved due to the good access to a broad base of information within and outside the team. This helped to make clear decisions with good awareness of all necessary knowledge and information. To create this awareness one needs to employ an independent moderator to lead the team in certain phases of the project. The availability of this moderator equipped with this know-how could become an issue for other teams in the future.

SECURING CRITICAL INDIVIDUAL KNOWLEDGE

The third issue was the concern of people with critical know-how leaving the team too early. When this happened in the past usually the people left their documentation with their colleagues or passed it onto the successor. However, this was by far not enough to secure the critical knowledge of that person. Specific knowledge about relationships to customers, suppliers and people within the organization got lost. What got lost usually as well was knowledge about specific success factors, experience how to deal with critical situations. These aspects were hardly ever recorded.

Tom was wondering how this issue could be addressed. In the discussion with Peter they developed an idea for a structured individual debriefing process that would harvest a large portion of the individual knowledge. Using this process the team could reduce the risk of losing time critical know-how.

6. CONCLUSION

Tom Brown became convinced that knowledge management techniques should be used in every project. He was contemplating how to make his experience known to the rest of the organization. The integration of knowledge management techniques into the working process has helped to reduce personal stress and increased job satisfaction among team members. The team has experienced acceleration in their work, which translated directly to shortening the time to market in a critical business segment.

For many managers knowledge management belongs to the category of exercises without added value: lot of work without clear benefit. However, Tom's experience shows that knowledge management techniques are not only highly effective, but also well accepted, when they are seamlessly integrated into existing processes and work procedures. At the end this comes down to "Action learning" instead of "Learning Actions".

7. QUESTIONS FOR DISCUSSION

- What have been the success factors of Tom Brown's assignment, considering specifically the individual, team and organizational knowledge management levels?
- In which way did Tom Brown integrate the knowledge management techniques into the existing project management procedures?
- Where does the leverage and benefit of PEAK and CORAL techniques come from? In what other circumstances could they be successfully implemented?