The STAPS Method
Process-taylored Introduction of Knowledge Management Solutions

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Abstract: Nowadays, knowledge is recognized as an important enterprise resource. Thus, knowledge management is perceived as a necessary management task. Process oriented knowledge management is an approach that aligns knowledge management with the requirements of knowledge intensive processes. However, existing approaches to the implementation of process oriented knowledge management either operate on a very high abstraction level, incorporating much effort for operationalization in practice or on a very detailed level concentrating on process modelling. This paper introduces the STAPS method for the process oriented analysis and implementation of knowledge management solutions. It allows the assessment of already existing knowledge management solutions, the adoption of new solutions based on best practises, and a tailoring to organizational needs. In a case study, the applicability of STAPS is proved.

1 INTRODUCTION

Nowadays, knowledge is recognized as an important enterprise resource. Thus, knowledge management is perceived as a necessary management task. Here, business process oriented knowledge management aims at the ways of dealing with knowledge as well as requirements for knowledge and knowledge activities (use, production, and transfer of knowledge) in business processes. Remus puts knowledge-intensive business processes in the focus of a process-oriented knowledge management (Remus 2002, p.108). Here lies the biggest success potential for knowledge management.

Knowledge intensive business processes are commonly found in knowledge-intensive domains and are characterized by a high degree of complexity. Control flow varies widely, so that a high coordination and communication effort is required. Knowledge-intensive processes are often poorly structured, show a high number of participants (experts), and are difficult to plan. Due to their nature, it is difficult to reassign tasks to different individuals (Remus 2002, pp. 104-117). Heisig sees as the most relevant criterion of knowledge-intensive processes that required knowledge can be planned ahead only in a limited manner (Heisig 2002).

Therefore, planning and organizing knowledge management with regard to these processes should rather consider modelling the context of knowledge intensive processes than modelling the processes themselves in detail. For example, there are approaches to knowledge intensive process modelling that omit control flows or remain at a very abstract level (Sigmanek and Lantow 2015).

Most organizations have already some knowledge sharing solutions. In the most primitive way this is a shared file storage and of course a regular meeting. Additionally, not all processes within an organization are knowledge intensive and not all knowledge intensive processes need special support or can be improved compared to existing solutions. Thus, a method for the introduction of a knowledge management solution should start with an assessment of the organization's processes, existing knowledge management solutions and the context of knowledge intensive processes. Looking into existing approaches for the introduction of knowledge management solutions, they mostly fail in one aspect (Sigmanek and Lantow 2015): KMDL (Gronau 2004) concentrates on a very detailed process model. KPR (Allweyer 1998, pp. 163 - 168) remains on a strategic level and does not consider existing solutions. PROMOTE (Hinkelmann et al. 2002, pp. 65 - 68) mainly focuses on IT support for knowledge

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managements but does not consider process context. KIPN (França et al., 2013) just provides a notation for process modelling and analysis. GPO-WM (Heisig 2002, pp. 47 – 59) looks into the context of processes and suggests best practises for known knowledge management related problems. However, GPO-WM does not consider existing solutions, does not allow much tailoring.

In contrast, STAPS (**S**coping-**T**ayloring-**A**nalysis-**P**roblem-**S**olving) starts with an analysis of process context and existing knowledge management solutions. Furthermore, it compares the organization's setup with best practise solutions for knowledge management. There is still a need for a methodology that helps small and medium sized enterprises dealing with knowledge management (Borchardt et al. 2014). Due to thigh adaptability of STAPS, the method is also fit for these settings. A major mechanism to ensure this is the tailoring as part of the method.

In the following, this paper presents an overview of relevant best practises in knowledge management in section 2. Section 3 then describes the STAPS method. A case study that shows the applicability of STAPS is sketched in section 4. Finally, section 5 draws conclusions und makes suggestions for further steps regarding research and implementation of STAPS.

2 BEST PRACTISES IN KNOWLEDGE MANAGEMENT

There are two aspects regarding best practises in knowledge management. First, knowledge management must contribute to organisational success. Thus, appropriate knowledge management functions and IT as well as organizational solutions that implement these functions need to be identified. Second, knowledge management will only be successful in the right organizational context (Lehner et al. 2007). Hence, success factors for knowledge management regarding management and culture in organisations have to be considered.

2.1 Knowledge Management Solutions

A lot of business processes contain unproductive efforts. These efforts result from search times, errors, double work, and loss of knowledge. Knowledge management can contribute to the organizational success by reducing or avoiding them. Another benefit of knowledge management is an increased product quality by revealing process knowledge and making processes controllable. (Bergrath et al. 2004, pp. 115-116)

Aiming at these benefits, a set of questions that need to be answered for the implementation of knowledge management can be derived:
How can …

- search times be reduced?
- knowledge be found?
- double work be avoided?
- explicit knowledge be stored?
- knowledge loss be avoided?
- knowledge be transferred?

And additionally:

- What IT-support exists for knowledge management?

In the following, each of these questions is addressed.

How can search times be reduced? Here, the reasons for search times are important. Search for knowledge is necessary when a worker does not carry the knowledge that is required for performing his or her task. Thus, the required knowledge needs to be identified, found and transferred to the worker. Best practise solutions provide functionality that supports the search for knowledge carriers. This leads to the next question.

How can knowledge be found? It is essential to have a systematic way to structure the knowledge. Thus, documents containing knowledge and knowledge carriers must be connected consistently to this knowledge structure. This structure can be created using taxonomies, folksonomies, or ontologies. Furthermore, this structure needs to be maintained, knowledge must be accessible and processible in order to foster the use of respective knowledge management solutions. (Probst et al. 2012, pp. 197-221)

A best practise solution in this area are yellow pages, making domain experts identifiable (Probst et al. 2012, pp. 65-91; Stocker and Tochtermann 2010, p. 117). Another solution is a central helpdesk that automatically classifies requests using text analysis methods. Having such a system as a single point of entry, user specific views can be generated which also contribute to a reduction of search times by pushing relevant knowledge to the right workers (Heck 2002, p. 171-183). Other solutions that help finding knowledge are: project data bases, search engines, data base management systems, content management systems, and forums (Bredehorst et al. 2013, p.6).

How can double work be avoided? Double work happens for example when content is maintained separately at several locations. Party, this redundancy is intended. However, in a lot of cases it is unwanted.

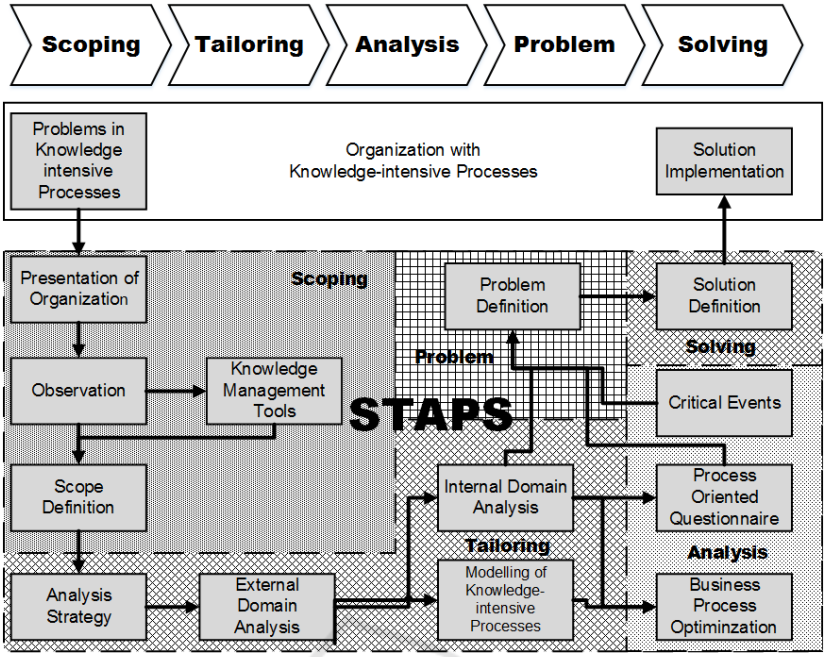

Figure 1: The STAPS method components.

A first step in avoiding double work is supporting the search for knowledge as described for the previous question. In addition, groupware systems and job rotation are solution in order to avoid double work (Bredehorst et al. 2013, p.6).

How can explicit knowledge be stored? Here, the focus lies on quality of the stored knowledge. One important aspect is the representation of knowledge. There is no best way. A video for example can capture movements while a full text search in a video is nearly impossible. Thus, the appropriate representation depends on the domain. However, techniques for automated and semi-automated analysis and tagging of streaming formats exist. Another aspect of knowledge quality is the aging of knowledge. Outdated knowledge must be removed from the knowledge base. And at last, noise is a factor to pay attention to. When capturing knowledge, the fraction of irrelevant parts in the data set should be low in order to support the use of knowledge (Bergrath et al. 2004, pp. 124-125). This includes audio and video streams as well as e-mail communication containing emails that are "off-topic",

How can knowledge loss be avoided? Besides appropriate storing of knowledge, knowledge monopolies should be avoided. Hence, overlapping personal knowledge bases of employees reduce the knowledge loss if an employee becomes unavailable. Furthermore, the knowledge structure should be analysed for monopolies (Pogorzelska 2009, pp. 56-60, 78-79).

If several individuals incorporate the same organizational role a knowledge exchange between all of them is important. Knowledge transfer is always connected with a loss of knowledge. This is true especially for a knowledge transfer via third and fourth persons. Therefore, flat hierarchies are suggested (Pogorzelska 2009, pp. 59-68). Furthermore, business processes should be structured in a way that an employee carries the complete knowledge that is needed to perform the process activities that are assigned to him or her. Otherwise, knowledge transfers would be necessary and a loss of knowledge within the process execution is likely. However, in many cases such a structure is not possible for knowledge intensive processes. Thus, forming teams that name responsibles for knowledge topics within the teams is suggested (Bergrath et al. 2004, pp. 130).

How can knowledge be transferred? Transferring complex knowledge, a collective memory performs better than an individual one. Therefore, complex knowledge should be transferred from one group to another (Probst et al. 2012, pp. 197-221).

Other tasks of knowledge transfer are the exchange of expert knowledge and of implicit knowledge. If expert knowledge should be transferred, techniques like knowledge relay (Stocker and Tochtermann 2010, p. 117) and expert debriefing are suggested.

For the transfer of implicit knowledge, a triad talk is suggested (Dick 2010, pp. 375-378). In a triad talk, domain expert and knowledge receiver work together

Table 1: STAPS guiding questions.

Knowledge Management Solution	Knowledge Resource or Carrier	Communication Channel
Is this solution known and available?	Is this resource/carrier known and available?	What is the fraction of relevant information/knowledge?
Is the way access known?	How are the response times?	What is the probability of overseeing information/knowledge?
Has the solution been used?	Is this resource/carrier frequently used?	What information/knowledge is lost?
Was the solution helpful	How is the provided knowledge quality?	Is the knowledge consistent at sender and receiver side?
How was the solution applied?	What is done to improve knowledge quality?	

with a moderator. If the transfer process is planned to last for a longer period of time, an additional expert (mentor) may be assigned (Maier 2007, p.169).

What IT-support exists for knowledge management? Maier (2007, pp. 548-563) identifies 7 functional areas: (1) Search, (2) Presentation, (3) Publication, (4) Acquisition, (5) Communication, (6) Cooperation, and (7) E-Learning. There are several application systems that provide the respective functionalities. Each of them has specific strengths and weaknesses. Generally, knowledge management systems combine several if not all of these functionalities.

2.2 Management and Culture

As already stated, the success of knowledge management implementations depends on the organizational context. For example, the knowledge management assessment tool which was developed by the American Productivity & Quality Center (APQC) can be used to check these factors (North 2011, p. 200).

Lehner et al. (2007) analysed success factors of knowledge management in a multi case study (64 cases). They defined measurable indicators for success in the areas ‘management’ and ‘culture’. Management subsumes the engagement of management representatives for knowledge management while Culture addresses the behaviour and attitude of employees towards knowledge management as well as their involvement in knowledge management processes. Example indicators are (Lehner et al., 2007, pp. 27-34)*:*

Management:

1. Knowledge Management is actively lived
2. Knowledge Management is financially supported.

Culture:

1. Meetings are conducted face-to-face
2. Culture of knowledge sharing

A complete list can be found in the named source.

3 THE STAPS METHOD

In the following, the STAPS method is presented. It has been developed in order to have a method for the introduction of knowledge management solutions that can be tailored to the needs of an organization. Thus, there is no organization wide major step to an integrated knowledge management system required as suggested by Allweyer (1998), nor is STAPS just providing a notation for knowledge intensive processes. Existing knowledge management solutions can be improved and the scope of analysis can be set to single processes and organizational units based on STAPS. Thus, STAPS is also a valuable tool for small and medium sized companies. Furthermore, STAPS uses the best practices for knowledge management as described in section 2 in order to provide means for analysis and for the creation of an action plan in order to solve found problems.

STAPS consists of the following phases: (1) **S**coping (2) **T**ailoring (3) **A**nalysis (4) **P**roblem and (5) **S**olving (see figure 1). Each of them is described in a separate subsection.

3.1 Scoping

The Goal of the Scoping Phase is to determine processes, tools, and possibilities for the further analysis of knowledge management solutions. This phase is divided into four method components: (1) Initial Workshop; (2) Observation; (3) Assessment of Knowledge Management Tools and (4) Scope Definition.

Initial Workshop. The initial workshop is used to provide an overview of the domain und the business activities of the analysed organization. Additionally, first problems perceived by the management are collected. A second function of the workshop is

getting to know each other and to form a base for cooperation throughout the analysis project.

Observation. Since the initial workshop is held with participants on management level, it is likely that the subjective view of a few representatives prevails. Furthermore, not all information to determine the scope of a detailed analysis can be gathered. Thus, business process execution is observed and compared to the results of the initial workshop. The observation is used to determine roles, their responsibilities and their usage of information systems, especially those that implement knowledge management functionality. The observation can be undertaken either in-place or in form of a workshop where typical work activities are demonstrated and explained.

Knowledge management tools. In this step the currently used knowledge management tools are assessed. They are categorized regarding functionality (see section 2.1, *What IT-support exists for knowledge management?)* and their usage in business processes. The resulting map of knowledge management tools helps to identify areas that need deeper analysis and to transform general STAPS-questionnaires to organization specific instances. For example, "How do [workflow management systems] support your daily work?" turns into „How does JIRA support your daily work?". Thus, interviewees do not need to know workflow management systems in general but only the concrete systems they use.

Scope Definition. Here, process parts are identified, that should be part of further analysis. This assessment considers two dimensions. First, relevance of knowledge within in the processes or process parts needs to be considered. The basic question is whether knowledge management solutions are the right tool to improve process performance. Knowledge intensity within the processes is determined using a questionnaire based on the work of Remus (2002). Second, the organizational priorities have to be taken into account. Thus, identified knowledge intensive processes are prioritized.

The Scoping results in a list of processes or process parts that will be subject of further analysis.

3.2 Tailoring

The Tailoring is the second phase of STAPS. It consists of the method components (1) Analysis Strategy; (2) External Domain Analysis; (3) Internal Domain Analysis and (4) Modelling of Knowledge Processes.

Analysis Strategy. A further tailoring of the STAPS process to the organization and its goals is done. The analysis strategy determines time frame, resources, and cooperation forms for the analysis project. Additionally, the core goals of the analysis need to be set. This comes together with expectations for the outcome and management commitment to the analysis project. Missing management commitment is a common cause for failed knowledge management related projects. The goal of the STAPS project should be aligned with the organizational goals in this step.

External Domain Analysis. Sector specific processes and knowledge management solutions are analysed and transferred to the organizational context. Literature analysis is used in order to find reference processes. The general goal of this method component is the use of the advantages provided by reference models (for example ITIL 2011). They should contain best practice solutions and they can be used for communication regarding sector specific terms and their semantics. Thus, the internal analysis is supported by the use of a common vocabulary. If there are no reference models there is still the same potential in collecting sector specific knowledge regarding processes and terms.

Internal Domain Analysis. Here, the organization itself and cross-process aspects are analysed. Regarding organizational structure and culture, there is a focus on reasons for employee fluctuation and on inhibitors/catalysts of knowledge sharing. Furthermore, important terms and concepts are collected and mapped to existing reference models and to business processes.

Modelling Knowledge Intensive Processes. Knowledge intensive processes and their variants are modelled with a role perspective. The interviews for gathering the required information are tailored based on the results of the scoping phase (map of knowledge management tools) and the domain analyses (reference processes, reference terms, and organizational structure). Knowledge carriers are identified. Activities that produce or require knowledge collected as well as the typical ways of knowledge transfer connected to these activities.

STAPS intentionally does not use an instance based model of knowledge intensive processes as suggested for KMDL. This is because, the transferability of the analysis results would be compromised if just the situation of a single subject would be modelled. Furthermore, no special notation for process modelling is required. As shown by França et al. (2012), existing modelling notations for business processes cover a majority of modelling requirements for knowledge intensive processes (e.g. EPC, BPMN). Missing elements can be added.

Another argument for not using special notations lies in the better understandability and utility of the models for the organisation's representatives if a common modelling notation is used.

The result of modelling knowledge intensive processes is an as-is-model that can be further analysed. The model contains the processes and their context for further analysis.

3.3 Analysis

In analogy to GPO-WM WM (Heisig 2002), STAPS uses guiding questions for the identification of problems. Due to the restrictions regarding modelling, formal reports as suggested for KMDL are not considered. Instead, the method of critical events is used (Trier and Müller 2014). It also provides a more objective view on the processes. Not all problems related to knowledge intensive business processes are addressable by knowledge management solutions. Some problems may be solved by classical business process optimization techniques (see below) which is also part of STAPS. In consequence, the analysis phase has the method components (1) process Oriented Survey; (2) Business Process Optimization and (3) Critical Events.

Process Oriented Survey. For the interviews, the method for the assessment of knowledge intensive processes by Trier and Müller (2004) has been adopted and significantly extended. Additionally, a focus on the quality of knowledge transfer has been set. Figure 2 shows the conceptual model of knowledge transfer quality. It shows, that search times increase due to insufficient transparency and knowledge quality. Loss of knowledge occurs in the communication channels. Thus, these aspects became part of the questionnaire. The questionnaire is considered to be process oriented because it starts with the understanding of the process before addressing knowledge management issues based on it. This part of the questionnaire is shown in table 1. The questions consider knowledge solutions, carriers/resources and communication channels with a specific sub-set of questions. The questions are going to be applied to all relevant entities that have been identified in the tailoring phase. However, the focus is not only on Problems but considers all aspects of a SWOT analysis. A complete picture of the processes should be created this way. In the next phases (Problem /Solving), the responsible actors should be aware of strengths that might get lost and risks caused by organizational changes.

Critical Events. The observation of critical events is a second input for the identification of problems. Trained observers watch for deviations in the regular process flow. They capture how the employees react on these deviations. Additionally, bottlenecks and communication problems are documented. Thus, observing critical events provides valuable input for the analysis.

Business Process Optimization. Methods of classical process optimization are applied (see Arndt 2015, pp. 35-42; Koch 2011, pp. 115-183; Wolf et al. 2013, pp. 203-221). A prerequisite for this step is that the processes have been modelled in a process modelling notation. It is analysed whether activities can be parallelized or omitted. Also bottlenecks and redundant activities can be identified. These problems of classical process optimization are not further considered here because the focus is on knowledge management solutions. However, in a real world environment re-organization projects should be initiated if the potential benefit of process optimization is high enough.

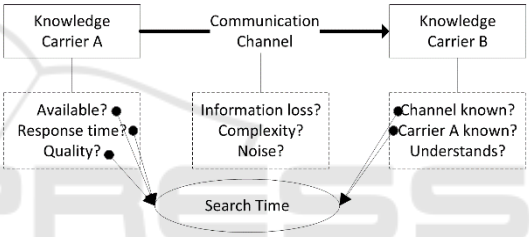

Figure 2: Quality of a knowledge transfer.

3.4 Problem

In order to derive a concrete action plan from the analysis results, these have to be assessed. Weaknesses and risks are rated regarding the need for action and the effort for solving them. This includes a comparison of the as-is-model with best practises in knowledge management (see section 2), including organisational structure and culture. Also interdependencies between problems are taken into account. The following questions are in focus:

- What is the problem?
- Is it a current problem or has it been solved?
- How often does the problem occur?
- Is the problem found to be threatening business?
- Are there workarounds?
- What consequences does the problem have?
- Are there dependencies with other problems?

After categorization of the identified problems, an ordered list of problems that actually need action is provided.

3.5 Solving

In the Solving Phase, concrete measures to address found problems regarding knowledge management are selected. This starts from problems that can be matched to the questions defined in section 2.1. If there is a match, knowledge management solutions that are assigned as best practises to the respective questions are appropriate solution candidates. Furthermore, problems that arise from deviations between actual process execution and the reference processes found in external domain analysis can be solved by reorganisation. Deviations from best practises (see section 2.2) regarding organizational culture and structure will need further investigation. There is no off-the-shelf solution. However, a list of problems and solution candidates is created in the solving phase. Before a decision is made about actions to solve the found problems, the effort of each of the solution candidates needs to be estimated and possible side effects have to be collected. In the last step the representatives of the organization decide about the action plan based on the prioritized problems together with the respective solution candidates. Due to the involvement of organizational representatives, a better commitment to the implementation of planned actions is expected.

4 CASE STUDY

The STAPS method has been applied in a small company (24 employees) that provides software maintenance services. The *Scope-Phase* has been used to assess all IT-systems that provide knowledge management related functionality and to identify processes that were subject to the STAPS-based analysis. Using the questionnaire in accordance to Remus (2002), the following knowledge intensive processes have been identified and selected: (1) Change Request (2) Bug-fixing (3) Setup project organization (4) Integration of new team members.

The domain analysis that has been performed as part of the Tailoring-Phase identified ITIL as source for reference processes in the external analysis. For the internal domain, the organizational structure and general aspects of organizational culture and management regarding knowledge management have been assessed (see best practises in section 2.2). The following shortcomings have been found already in this phase: (a) Knowledge management is supported but not used at higher level management (b) Access to knowledge management systems is complex (c) knowledge management activities are additional effort to customer projects which is not billed (d) Knowledge management activities are not integrated into the business processes.

Based on the results of the *Tailoring-Phase*, the process oriented questionnaires for the *Analysis-Phase* have been created. Taking the process (3) Setup project organization as an example, the following knowledge sources/carriers have been assessed: (1) Employee data base (2) HelpDesk (3) Higher management (4) Customer (5) File Server (6) Software Maintenance Guidebook. It revealed, that information in the employee database was outdated in some cases and this database was seldom used. Furthermore, feedback and improvements regarding the helpdesk and the software maintenance guidebook were only provided by half of the staff.

Table 2 shows the problems regarding knowledge management and their ratings as a result of the *Problem-phase*.

Table 2: Problems identified based on STAPS.

Problem	**Importance**
No single point of entry for knowledge management systems	Low
Different usage level of knowledge management tools	Medium
Documentation is not persistent	High
Inconsistent terminology	Low
Problems in workshop/meeting organisation	High
High number of contacts on customer side	High
Management is overstrained	Medium

Additionally, management problems (see section 2.2) and structural problems have been identified and assessed.

Based on the lists of problems an action plan has been developed in the *Solving-phase*. It includes for example new rules for workshop/meeting organization, a standard terminology for project documentation and the introduction of a mentoring-program for new team members.

Overall, the case study showed the applicability of STAPS. The company's representatives considered the outcome of the STAPS implementation as useful.

5 CONCLUSION

STAPS shows the following characteristics by design:

- Flexible tailoring even to small knowledge management projects

- Inclusion of process context
- Inclusion of existing knowledge management solutions
- Assessment of knowledge sources/carriers
- Best practise solutions
- Involvement of stakeholders
- Stakeholder specific adaptation of method components
- Inclusion of classical process improvement approaches

The performed case study showed that these characteristics also hold for an application of STAPS in practise. More cases should be collected in order to improve the method and its components. A major issue is the question of scalability. Some of the suggested method components may not be applicable at large scale. For example, the observation of critical events is time consuming and will increase effort highly in large settings.

An aspect for further improvement of the method is tool support. Text analysis techniques and mobile data collection solutions may reduce effort and allow automated identification of problems.

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