Pattern based Analysis and Redesign of Knowledge Intensive Business Processes

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Abstract: Knowledge management aims at increasing efficiency of knowledge related work. The Knowledge Modelling and Description language offers a modelling and analysis approach to knowledge intensive business processes, which results in improved processes.

1 Business process oriented knowledge management with KMDL®

Applying intellectual resources has become the key success factor for companies. Therefore knowledge management introduces concepts and methods to 'control' or at least to promote systematic knowledge development and use. However, in the past many approaches to knowledge management have been rather technology driven. Assuming proper utilization, these solutions bear an enormous potential for business improvement. In practice however, only small parts of this potential is used. One of the reasons is the lack of integration of knowledge management (and its tools) with business processes. Further, to a high extend, business processes represent the context of knowledge application in order to generate value for a company [Ab02]. This mismatch is addressed by the research area of business process oriented knowledge management. A central element is the understanding of knowledge related activities within business processes [Re02]. Therefore most popular approaches to business process oriented knowledge management (e.g. [He03], [Al02]) extend existing business process modelling methods to capture, model and analyse knowledge activities, as well as existing explicit and tacit knowledge. The derived actions are individual by approach, e.g. selecting supportive knowledge management methods [He03] or implementation of an intranet portal [Ba02]. Assuming that value generated through knowledge is high in knowledge intensive business processes, a focus on these processes is set. This implicates for the approaches to deal with the characteristic of knowledge intensive processes, such as e.g. creativity, employee autonomy and weak defined tasks [Re02].

The Knowledge Modelling and Description Language (KMDL®) is developed to create a model of knowledge activities in knowledge intensive business processes [GMU04].[1] It inherits the implications made above and aims at a general business process improvement through actions derived from the previously analysed current state of the process. Four knowledge conversions are a central concept of KMDL® [NT95]. An internalisation describes the interaction and conversion of information to tacit knowledge. An externalisation represents the conversion from tacit knowledge to information. A socialisation depicts the reconstruction of tacit knowledge by a second individual. In KMDL® a socialisation represents the transfer of tacit knowledge from one employee to another by personal communication and interaction. Finally, a combination describes the creation of new information from existing information. Therefore KMDL® differentiates information as well as tacit knowledge. KMDL® models represent information used and created within the process, as well as tacit knowledge used and required by individuals to perform tasks. Both are represented through objects that respect the specific characteristics, e.g. tacit knowledge is bound to an individual bearer.

The K-Modeler is a software tool designed to support creating and analysing KMDL® process models. Therefore features to support process modelling work, e.g. syntax checking, as well as report functions are implemented. In addition K-Modeler performs automated detection of process improvement potentials based on predefined patters. This allows for a systematic analysis of models of knowledge intensive business processes.

2 Analysis of potentials with KMDL® process patterns

This chapter will explain the process potentials which describes the KMDL® process patterns. The pattern concept was coined originally by the architect and mathematician Christopher Alexander. Patterns are an instrument to reuse knowledge and the idea is used to find solutions for recurring problems [KJ04], [Gr04]. In the nineties the concept of patterns and best-practice solutions was transferred in sub areas of software engineering by Gamma et. al. [Ga94]. The principle of patterns is used in KMDL® to analyse knowledge intensive business processes. Thereby a single process pattern describes a specific situation which occurs repeatedly in these processes. It is an indicator for hidden process potentials and points out opportunities for an alternative process design. The process patterns introduced in this contribution are derived from known disadvantageous settings of process elements and structures found in models of knowledge intensive processes [Wi98]. They are derived from several practical projects where KMDL® was applied, e.g. in M-WISE[2]. Figure 1 provides an overview of the five pattern categories:

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[1] For further information on KMDL and K-Modeler see: http://www.kmdl.de
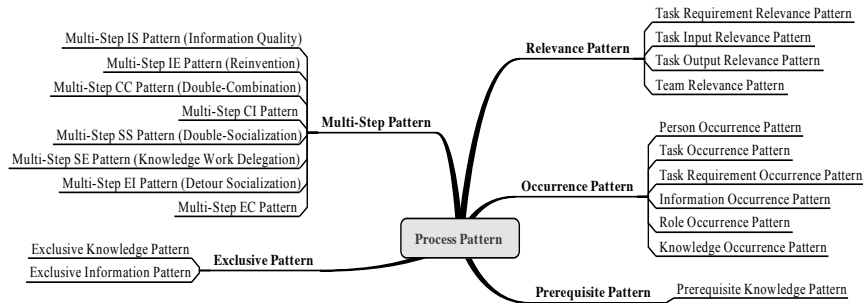[2] For further information on M-WISE see: http://www.mwise.de

figure 1: process patterns

- **occurrence patterns:** The pattern of occurrence shows where specific objects appear with exceptional frequency in the considered business processes. For instance if a specific person shows up very often in the processes this could be a clue for a monopoly. The pattern can show that one person holds knowledge of high process relevance and this can lead to problems if the person resigns from office. A better responsibility assignment can be an idea for improvement. The pattern can be used not only for the occurrence of persons (see figure 2) but also for information and roles.
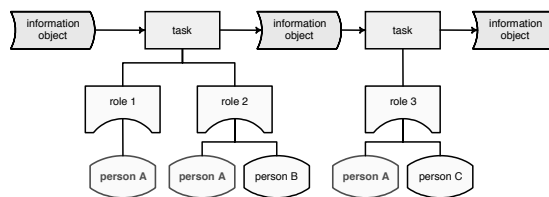

figure 2: person occurrence pattern

- **multi-step patterns:** The multi step pattern category describes a combination of two knowledge conversions, whereby transitions from tacit to the explicit process level vice versa will be analysed. There is also an examination of conversion doubling on the same level. Twelve different combinations of knowledge conversions are imaginable, but only the included patterns show potentials in the process design. The multi step socialization pattern is one example of a multi step pattern, this is also known as the 'chinese whisper' effect, where information gets lost or changed in a chain of socialization. (see figure 3)
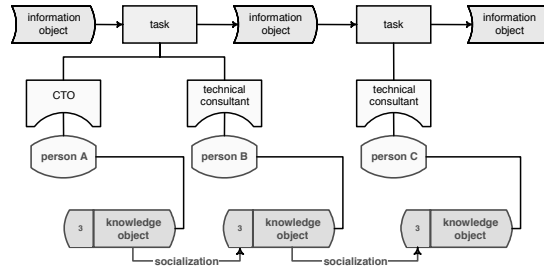
figure 3: multi-step socialization pattern

- **relevance patterns:** Relevance patterns refer to tasks with a high degree of complexity and knowledge intensity. There are four types of relevance patterns which indicate tasks with a great amount of input (knowledge objects, information objects), output (knowledge objects, information objects), integrated persons or task requirements. A suggestion for improvement can be a task reorganization and therefore the creation of smaller tasks, which run parallel and sequential. (see figure 4)
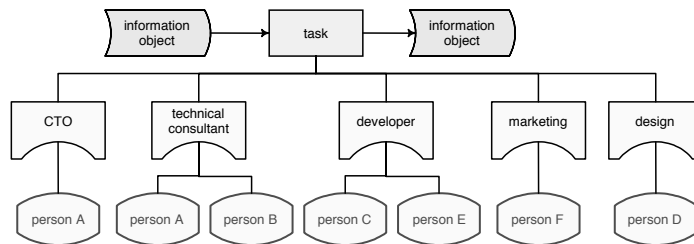

figure 4: team relevance pattern

- **exclusive patterns:** Two types of the exclusive pattern category are distinguished: exclusive information or exclusive knowledge pattern. Thereby it is shown that there are certain information or knowledge objects in the business process which are requested very frequently. The loss of these process relevant objects can lead to a process disruption. Therefore the information or knowledge has to be secured, for example by externalisation of specific knowledge objects. (see figure 5)
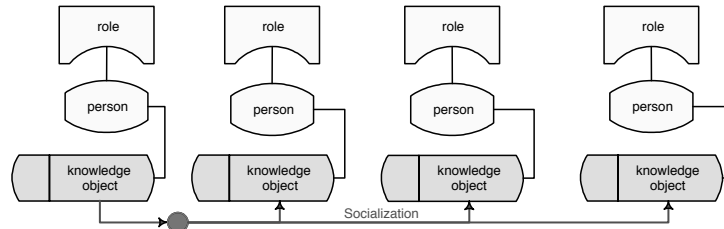
figure 5: exclusive knowledge pattern

- **prerequisite pattern**: The prerequisite pattern describes a process involved person, which only has the ability to fulfil a task after the generation of knowledge through a socialisation with a non-involved person. The informal acquisition of knowledge depends on personal preferences and the personal social network. A method of resolution can be the institutionalisation of the knowledge transfer. (see figure 6)
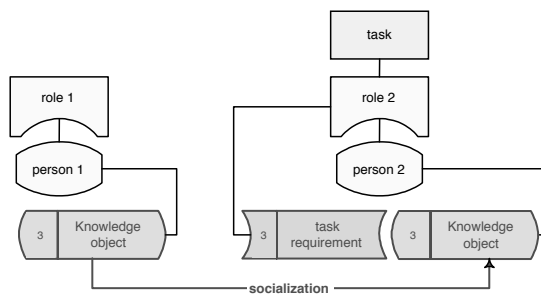

figure 6: prerequisite knowledge pattern

In many cases, the introduced critical points cannot be identified directly in 'real life'. Therefore the creation of formal KMDL® models of knowledge intensive business processes is a prerequisite to identify potentials and weaknesses. The introduced approach is an effective way to identify potentials systematically, which forms as a first step towards process improvement.

3 Design of knowledge intensive business processes

The second step towards improvement is achieved by redesign of the process. Therefore each pattern includes a standard suggestion for a better business process design. This includes a change of knowledge activities. These recommendations are pattern specific. In this contribution a selected example is introduced which is based on the multi-step socialisation pattern. Two possible recommendations for process redesign exist:

- If feasible, arranging a meeting where all persons that require the knowledge at a later point participate. This results in parallel or even repeated socialisations, diminishing transfer failure rate through chain socialisations.
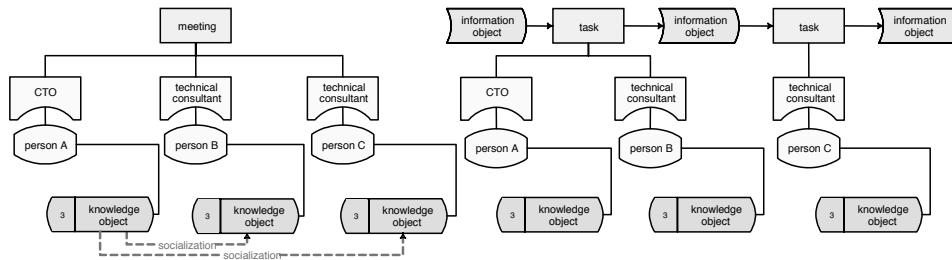
figure 7: meeting as result of process redesign

- Documenting the knowledge (externalisation to an information object). It has to be considered that only parts of tacit knowledge can be codified. However, the created information can be passed (push) or made available (pull) to all receivers. This information processing can be enhanced through IT systems, allowing to solve distance and timing problems.
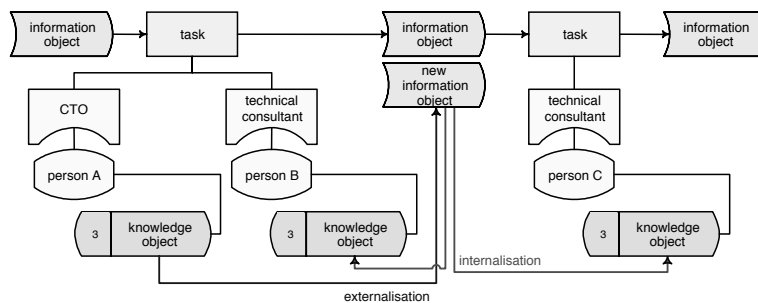
figure 8: new information as result of process redesign

4 Outlook

The introduced concepts improve the work of the process analyst significantly. Though creating an 'ideal' process involves more than the analysis of the process model (e.g. consideration of the company's strategy, ROI calculation). Nevertheless both, spots of potential as well as recommended solutions (best practices) can be avoided or suggested automatically during process development. Therefore the creation of supportive agents that guide the process modeller towards recommended process blocks in K-Modeler will be subject of further research.

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