

Analysis and Documentation of Knowledge-Intensive Processes

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Abstract. Business Process Management is a prevailing topic that addresses value-added activities in a company. Processes are modeled, realized, executed, and continuously improved. While this approach proves itself appropriate for routine work, it is not applicable for knowledge-intensive processes. Adaptive Case Management (ACM) defines this as knowledge work that is not or is rarely repeated, unable to be foreseen, occurs spontaneously, and depends on context. This paper pinpoints the differences between routine and knowledge work, and introduces ACM as a concept.

Keywords: Adaptive Case Management (ACM), Business Process Management (BPM), Knowledge Management.

1 Introduction

In recent years, knowledge work has gained significance importance in many companies. At the same time novel strategies are sought for providing ideal support to end users as well as for optimizing mainly unstructured and knowledge-intensive processes.

Davenport, on this basis, deals in his article “Rethinking knowledge work: A strategic approach” [1] with the question of how the productivity of knowledge workers can be enhanced, as they play a key role in companies’ success according to his point of view. Knowledge workers either act in defined procedures and processes or totally independently and based on their own preferences. In practice, the first approach often reaches its limits, as in general the processes are complex in a way that it is difficult to express within a normative process flow with a given notation. In these cases, it is therefore often too expensive to model and technically implement all process variants. Furthermore, especially in knowledge-intensive processes process descriptions need to be adapted while carrying out the actual work, demonstrating why the topic of ACM has a lot of potential in this context. Examples of processes’ diversity and adaptability can be found as part of patient’s medical records, insurance cases, law suits, or complaint handling.

In all of the examples above, however, it is obvious that these processes cannot be handled without human participation. The scope of the manual interactions depends

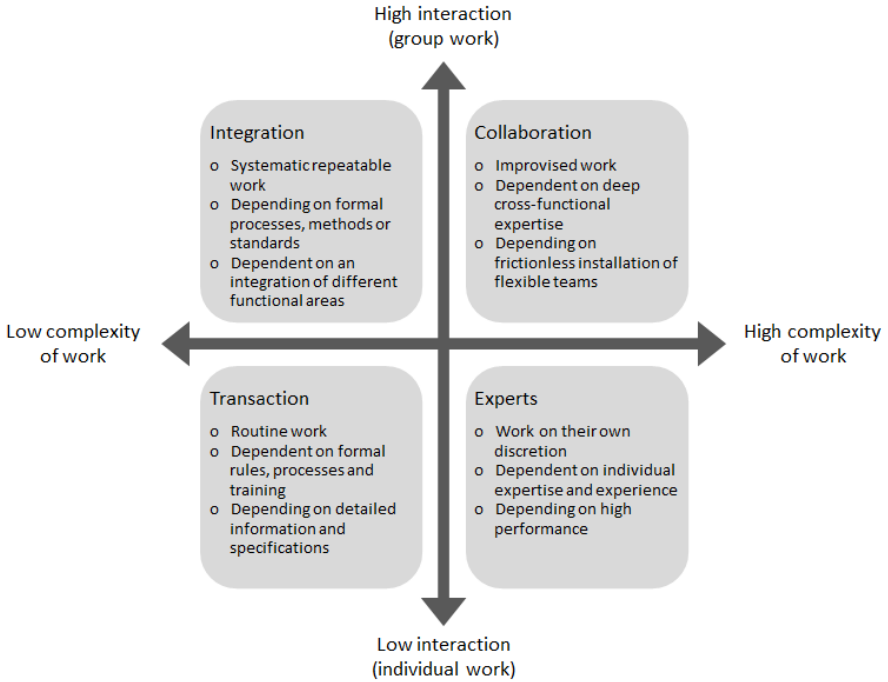


Fig. 1. Structure of different types of work according to Davenport [3]

on the respective case and can be different for each execution. In spite of the high integration of persons within a process, ACM should not be confused with expert systems. The difference between them is the addressing of different target groups. Expert systems are IT-based systems to identify possible solutions for tasks. For this purpose, expert systems include a knowledge base and algorithms to derive new knowledge. The knowledge of the system originates from experts and is represented by a model, enabling non-experts to solve knowledge-intensive tasks. ACM, on the other hand, does not try to map the knowledge of experts but to assist experts in knowledge tasks through IT systems.

This article is structured as follows: chapter 2 elaborates the differences between routine and knowledge work. Chapter 3 introduces concepts of Adaptive Case Management. Chapter 4 summarizes this work and provides an outlook for future work.

2 Routine and Knowledge Work

An essential concept of ACM is the distinction between routine work and knowledge work. The following paragraphs present different approaches for the differentiation of labor.

According to Swenson and Ukelson[2], routine work is understood and able to be planned by all parties concerned, and thus it is possible to describe it with structured

<p style="text-align: center;">Insurances</p> <ul style="list-style-type: none"> o Create insurance policies o Characterize insurance risks o Process damage claims o Pay pensions 	<p style="text-align: center;">Banks</p> <ul style="list-style-type: none"> o Process credits o Process complaints o Review customers o Create mortgages o Open accounts o Review credit card o Review creditworthiness o Manage investments 	
<p style="text-align: center;">Healthcare</p> <ul style="list-style-type: none"> o Manage patient cases o Customer management o Vendor management 	<p style="text-align: center;">Public authorities</p> <ul style="list-style-type: none"> o Manage compensations o Process aid requests o Support taxpayers o Manage legal proceedings 	<p style="text-align: center;">Provider</p> <ul style="list-style-type: none"> o Take over sovereign tasks o Claim management o Citizenship management o Property management

Fig. 2. Examples of knowledge-intensive work in the services sector [4]

business processes and objects. Knowledge work, however, is not repeatable. It is unpredictable and unfolds unexpectedly and robustly in different circumstances.

Knowledge-intensive work is not repeated or if so only rarely. This is the case in situations that occur sporadically, such as the merger of two companies. Work that occurs repeatedly can be documented and thus transferred into routine work. Furthermore, knowledge work is characterized by the fact that the sequence of steps is not predictable and varies depending on the situation. Swenson goes on to argue that knowledge work is iterative [2] and expands itself. This refers to the fact that not all possible tasks can be seen at the beginning of a process, but rather more options for action are revealed after each iteration, which lead to a desired result. An additional feature of knowledge work is that it can also be carried out under different and changing circumstances.

Davenport presents a further classification of work in [3]. Figure 1 shows four different types of work that differ in their complexity and the required interaction between workers. Transactional and integration work can be categorized under routine work. They require a specification as well as compliance with operational procedures, such as processes, which usually do not allow deviations. The types of experts and collaboration can be allocated in the category knowledge work. In order to assess and address complex tasks, knowledge and experience are required. In addition, unexpected work cannot be defined in advance, which leads to deviations, for example through improvisation.

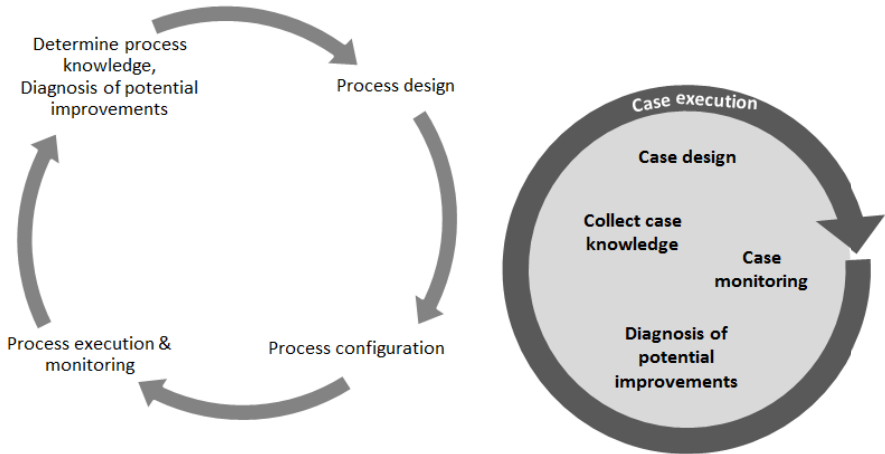


Fig. 3. Procedure of the classical process and case management

Economic sectors offer another way to distinguish routine work from knowledge work [4]: insurances, banks, healthcare, public authorities, and providers are characterized by the fact that they can be assigned to the service sector and imply a high level of customer interactions. In addition, experts are needed to perform the respective tasks.

Figure 2 shows examples of knowledge-intensive work according to the aforementioned economic sectors. The listed criteria for knowledge-intensive work can also be applied here. According to Zhu [4], use-cases for knowledge-intensive work, such as customer complaints, customer conflict management and fraud investigation, can be found in every economic sector.

3 Adaptive Case Management

After providing details about knowledge-intensive work and routine work, this chapter focuses on ACM as a business process management discipline. First, it is explained how documentation of adaptive processes differs from classical process modeling. A model is then presented that supports the identification of knowledge-intensive processes. Lastly, possibilities for eliciting and documenting adaptive processes are shown.

3.1 Differences between knowledge and Normative Processes

ZurMuehlen and Ho [5] define processes as a sequence of necessary activities in order to manipulate business objects in a goal-oriented fashion. Business process management, on the other hand, is described as the application of planning, control, and organization activities. Aalst et al. [6] define business process management as a

discipline to be able to analyze, define, establish, and control processes. Both definitions are based on the fact that management of processes is a sequence of discrete functions. The left side in Figure 3 shows the sequence of these functions. On the one hand, discrete in this case means that following functions can only be addressed if a function is completed, for example that a process can only be defined if the corresponding process knowledge was determined. On the other hand, the discrete sequence also implies that the processing of the individual functions is performed by various persons in different roles.

In the first step, a process analysis is performed to determine actual business processes in companies. This can be done through structured interviews, workshops or examination of documents in collaboration with process owners, process participants and analysts. In the next step, the processes with a normative character are defined by analysts. The process will then be implemented organizationally and technically by appropriate experts. The fourth step is the execution of processes by process participants. At the same time, the execution will be measured according to predefined criteria or KPI. This is particularly important for the subsequent step of diagnosing potential improvements for the observed processes.

The literature provides a narrow number of definitions for ACM. The Object Management Group (OMG) [7] defines case management as a goal-oriented discipline for holistic treatment of cases. A case in turn refers to a situation or a circumstance that requires a number of actions for an acceptable outcome.

Pucher describes ACM [2] from three perspectives: (1) ACM is a system that includes organization and processes which are transparent and freely modifiable, (2) employees are always in a position to define new processes or adapt existing ones on the basis of business objects, user interfaces, business rules, and social interactions, and (3) the collection and documentation of knowledge does not happen during a phase of discrete analysis but is shifted to the phase of the process execution (see right side in Figure 3).

Zhu et al. [4] describe ACM as the handling of cases. A case contains a collection of information and coordinated tasks which are performed by knowledge workers in order to achieve a desired goal.

It is evident that all definitions have something in common. Situations to which an organization is able to react are treated as individual cases. In addition, a case is not defined by a process or the stringent sequence of tasks, but rather a definition is made by one or more results and the possible optional execution of tasks. The decision as to which tasks result in a desired outcome is up to knowledge workers of an organization. Furthermore, it can be seen that functions relating to the management of cases are comparable with those of the traditional process management. Unlike process management, the functions are not performed discretely but rather continuously. The right side in Figure 3 shows that functions are performed continuously during case executions. Another difference is that the functions are primarily executed by participants (experts). The focus is thereby on the case processing or execution. Gained knowledge is continuously collected, analyzed and added to the case definition.

Characteristics	Routine work	Knowledge-intensive work
Quantity of repetition	High	Low
Determined unit	High	Low
Communication intensity	Low	High
Process complexity	Low	High
Number of persons	High	High
Qualification of persons	Low	Low
Degree of technology	High	Low
Relevant time	High	Moderate
Relevant quality	Moderate	High
Relevant costs	High	Low
Relevant risk	Moderate	Low

Fig. 4. Process types, Fischermanns [8]

3.2 Knowledge Processes

After distinguishing knowledge-intensive work from routine work, and the motivation of ACM as a solution for knowledge-intensive work, this chapter characterizes knowledge-intensive processes. The analysis of process types is important, since it may lead to different approaches towards how to elicit, analyze, and document business processes.

Fischermanns [8] distinguishes between three process types: (1) routine processes, (2) control processes, and (3) ad-hoc processes. According to him, routine processes can be treated with established process notations, but this does not apply to ad-hoc processes. At the same time Fischermanns offers characteristics for a distinction of ad-hoc processes (see Figure 4).

A similar approach is allowed by Kimsley [9]. She distinguishes between four process types: structured processes, structured processes with ad-hoc exceptions, adaptive processes with partially structures sub-processes and adaptive processes.

3.3 Documentation of Knowledge-Intensive Processes

After presenting definitions for ACM and demonstrating possibilities as to how knowledge-intensive processes can be identified, this chapter shows what means are

	Ukelson	Shepherd	Khoyi and Swenson	Zhu et al.
Goal	X			
Result document	X		X	X
Deadline	X			
Mandatory rules		X		
Optional rules		X		
Business object			X	X
Tasks			X	X
Roles				X

Fig. 5. Case conceptions

available for documenting such processes. As a running example, a process for vehicle damage report will be introduced. According to Ukelson[2], the goal-oriented processing of a case always includes staff and has a result document as an outcome at a specified deadline. In connection with the example, the case is defined as follows: the goal is to record the damage and to provide this damage report as a result document for an insurance company. A valid deadline has to deal with the reported damage within 6 hours.

Unlike Ukelson, Shepherd [2] additionally takes guidelines as part of a case into account. As well as providing assistance for employees while processing the case, guidelines can also map dependencies between tasks that must be adhered due to legal reasons or reasons of quality assurance. Shepherd describes guidelines as rules which either must be met (mandatory rules) or can be met (optional rules). Mandatory rules have a legal background, such as data protection. In case of the damage report, a mandatory rule can state that any damage notification has to be evaluated before it is processed.

Unlike the mandatory rule, an optional rule describes best practices or solutions. Such rules tend to encode the knowledge and experience of other knowledge workers who may be involved in current case handlings. In the case of the damage report, an optional rule can state that in event of a light collision the damage does not have to be reported to the insurance company but has to be paid by the company itself, since this is cheaper in medium-term.

Another definition of a case is provided by Khoyi and Swenson [2]. They describe the basis for the definition of cases with business objects (data) and their relationships among each other as well as with tasks to manipulate business objects and related documents. On this basis it is then possible to define cases as a logical connection of business objects, tasks and documents. In the context of a damage report, business

objects include the accident data, damage type and customer data. Tasks corresponding to the customer data of the business object may include creating a customer, searching lease contracts by customer ID or printing customer data. These business objects and tasks can be gathered together in a case damage report. The employee can manipulate objects through tasks, if he or she wishes to do so.

Similar to Khoyi and Swenson, Zhu et al. [4] define a case via over business objects, documents and tasks. In addition, Zhu et al. distinguish roles. This allows the determination of specific, competent and responsible employees for business objects or tasks. In connection with the example introduced above, different roles are responsible for processing a damage report: while an employee records the damage report, the head of department is responsible for assessing the damage report.

The definitions above illustrate the granted degree of freedom for knowledge workers. Figure 5 compares the different definitions. It shows that cases are described with different states and how these should be achieved to finish a case. The requirement of a sequential process is completely omitted, as is otherwise usual in the classical process modeling. An already mentioned possibility to structure the processing of a case is the usage of guidelines, which can be described by means of rules. Furthermore, it should be noted that business data and tasks assume a function in the framework of case management, although established processes are avoided.

4 Summary

Knowledge-intensive processes as well as Adaptive Case Management are often discussed in the scientific community. This article examines the differences between routine and knowledge work, and subsequently introduces the ACM concept as a discipline in business process management. As well as differentiating between classical approaches, it also analyses the various characteristics for identifying knowledge-intensive processes.

This paper presents possibilities for analyzing and documenting knowledge-intensive processes. On the basis of relevant literature, it shows how to define a case with the help of the example of the damage report process. It is particularly striking that the users and not the process determine the run time and which task is performed when. Adaptive processes enable the modeling of technical relevant aspects without being bound by notation rules or similar artificial determinations. Between the poles of standardization and individual freedom, this is an important prerequisite, since the optimal utilization of human resources, in this case the knowledge worker, takes priority.

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