Adaptive Case Management – Creating a Case Template for Social Care Organizations

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Abstract. Adaptive Case Management (ACM) is an approach for the management of knowledge-intensive processes. „Case Management Model and Notation"(CMMN) is an industry standard that can be used as a notation for process models in the context of ACM. However, CMMN only specifies a notation. Methods for process elicitation and management have not been well addressed by scientific investigations. This work assesses the method support and the feasibility of ACM on the example of a social care company. This company on one hand represents a typical environment for ACM application and on the other hand contains some characteristics that are common for the care industry. Thus, future development directions and an evaluation of existing and proposed methodology is provided in a qualitative way.

Keywords: ACM, Adaptive Case Management, Case Management, Social Sector, Social Companies, Knowledge-Intensive Processes, BPM 2.0, CMMN.

1 Introduction

In times of dynamic competitive conditions, multilayered and variable workflows and increasing dependencies of companies on capabilities, new approaches for the management of processes are necessary to handle the complexity.

Whereas a simple process capture through Business Process Management (BPM) seems to be outdated [1, 24, 26] to address this challenge, enterprise documentation is becoming increasingly important to use dynamic solutions [16]. One approach to managing current, knowledge-intensive processes is Adaptive Case Management (ACM). Just as in the field of business process modelling in the form of business process modelling notation, there is a standard industry notation for process recording in adaptive case management called "Case Management Model and Notation" (CMMN). However, CMMN defines only one possible notation for process models and hardly considers methods for the collection and management of cases that are of particular importance for knowledge-intensive processes. For this reason, this paper examines the research question: *Is Adaptive Case Management suitable for use in*

social settings? The work pursues the **goal** of **proposing a method component**, which serves to **create initial case templates and the definition of case objectives**.

To assure that and to address the research's aim appropriately, a company within the social sector was selected as a case study to test the method component. Therefore, the research follows a design-oriented information systems research approach with the underpinning of inductive reasoning. Derived from the findings of the case study, perceptions for the implementation of ACM in the social sector shall be gathered [29]. The corresponding company was selected because it provides two advantages. One the one hand, it represents a common environment for ACM application and on the other hand comprises some characteristics that are representative for the care industry. Thus, future development directions and an evaluation of existing and proposed methodologies are provided in a qualitative way.

Section 2 presents a selection of relevant literature and the principles of ACM as well as a reference to Case Management (CM) in social care. Section 3 introduces a possible solution for a method support for ACM in the social sector. Then, the method support is critically evaluated and extended. The following fourth section evaluates the extended method in a case study. The last section summarizes the findings, limitations and outlook of this work.

2 Adaptive Case Management and Social Care Processes

The following section will describe the relations between ACM and processes in social care. Therefore, the central features of ACM (section 2.1) are necessary and a distinction to traditional BPM (section 2.2) is conducted. Subsequently, section 2.3 provides the relation to social care processes, derived from the findings in section 2.1 and 2.2.

2.1 Central Principles of Adaptive Case Management

The term Adaptive Case Management (ACM) has its roots in the year 2009 and was developed by domain experts because they realized that the traditional operative Business Process Management (BPM) does not fit to the needs of today's knowledge workers anymore [1, 24]. Given that the context and management of working activities as well as environmental changes are increasingly significant, ACM addresses those needs as it manages responsibilities and activities that are required to complete a business case successfully [2, 24].

The innovation changed the management's view, as now a case and not a process is in the focus for illustrating different views on companies' processes. A case consists of a bunch of several tasks. There are planned and unplanned tasks that should fulfill a specific purpose. Each case can be divided into different tasks and processes. Thereby, each case is defined by its purpose and it is possible that one case contains multiple instances [2]. This is comparable to process instances, when processes are performed.

Based on the *case* term, the case template represents the equivalent of a process model in traditional BPM, whereas the case instance corresponds to a process instance [3]. Assuming that each case instance represents a different or even unique situation, the management of a case instance always takes a specific process flow into account [4]. In the same instance, all accumulated information and data about a task or the case instance itself are stored [2].

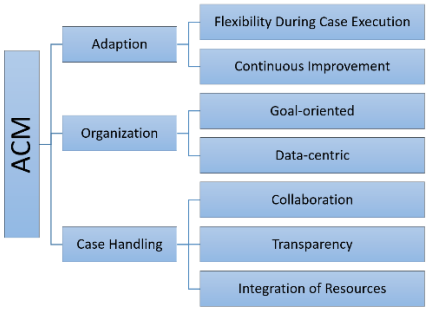

Fig. 1. Central ACM Principles, adapted from [5]

ACM enables the knowledge worker to perform configuration of cases and respectively of tasks on the fly without support from professional system developers (as a developer configuration activity). It is possible to create a collection of performed and to be performed tasks and to control case handling based on it. By avoiding double and contradictory work, collaboration and performance of the employees are improved. The work results can be optimized with regard to service quality, expense and time [2, 24].

Kurz and Herrmann present the central principles of ACM implementation [3]. They divide these principles between the areas *organization*, *case handling,* and *adaption*, as presented in figure 1.

In terms of the *organization*, a case always has at least one goal. The performed tasks contribute to the achievement of the goal and are directly connected to it. Thereby, it is difficult to control a case by a control flow because a case can comprise a high variability while the structuredness is low. Instead, the case process control is data driven. In order to reach the case's aim, tasks are bundled by the case and by case data [3, 24].

By considering the *case handling*, the knowledge work, or the tasks of a case respectively, are highly collaborative. All employees involved need to communicate with each other, to collaborate and to control the progress [6, 25]. Therefore, collaboration is a focal point of ACM. It can be reached by appropriate tools for social interaction [3]. These tools also need to assure the transparency that is needed for efficient case handling. All required internal and external resources like people and information connected to a case need to be provided in a structured manner. This means that all people involved in a case need to have access on the existing organizational knowledge and results of case handling [6, 25]. Transparency plays a decisive role

prior to, during and after handling a case instance. The employees need to know the tasks to perform and their relations to it before the case handling starts. At the same time, knowledge of prior case instances needs to be retrievable [6].

In the context of *adaption*, the focus is on knowledge work and the system should be designed so that the knowledge worker has the possibility of adapting this system to his needs. The consequent aim is that the knowledge worker adjusts the process appropriately, so that efficient processing is possible. The adaption can be done in two ways. First, during case execution, which describes the adjustments of the system to a specific case instance. As a result, it is always possible to edit the case instance flexibly. Therefore, external or internal events or case-internal findings may be the reason. Moreover, business rules ensure structured, efficient and targeted process management [3, 26].

The second way refers to the completed case instances and uses the knowledge gained from them to adapt case templates and continuously improve the overall system [6]. Important premises are, that errors are made only once and that frequently used case elements are made available for future case instances. An adjustment can be made for entire case templates or individual case components. This cross-case adaption describes the flexibility of changes in terms of business processes by both, the employees and by the system [3].

2.2 Distinction between Adaptive Case Management (ACM) and traditional Business Process Management (BPM)

While comparing traditional BPM and ACM directly, the different degree of determinacy becomes apparent. In BPM, the deterministic processes can be defined in advance. This requires, that the status of a process is fixed, while modeling it. The problem is that the actual process steps can be very complex and in need of flexibilization, whereas the decisions, rules and all influences that govern the process flow, as well as the mentioned status of the process, have to be predefined [27].

In contrast, ACM is not deterministic. The modeling aim is known, but the path to reach it is non-restricted and it is possible that this path will vary from case to case. In addition, a process in ACM often cannot be stopped because there is no predefined sequence of activities, but orders vary and activities can be processed in parallel [7].

A further development of the traditional BPM, which has similarities with the ACM, is the Business Process Management (BPM 2.0). The basic idea of BPM 2.0 is that employees, as part of their daily work, can independently propose process improvement potentials and make changes. This should result in process innovations, which are the defining goal of BPM 2.0. Often, the process innovations emerge through collaborative work among employees and through jointly developed ideas to improve processes. This should contribute significantly to the identified flexibility deficits in BPM [8].

BPM 2.0 incorporates approaches based on the fundamental principles of the ACM and becomes more flexible, especially because of innovation incentives and motivations for collaborative activities. However, regardless of the approach, BPM 2.0 suits

better for repetitive tasks, whereas ACM is intended for knowledge-intensive processes [3, 8, 28].

2.3 Social Care and Adaptive Case Management

Case Management (CM) is a standard for work organization in healthcare, family assistance, youth welfare, and care of the elderly [9]. In contrast to ACM, where process control and IT support are the main objectives, CM provides a holistic view of help-organization for a social sub-system in need (generally, these are people or families = clients ≡ case instances). Therefore, case management aims at an efficient and effective use of available resources [10, 11]. Within the social sector (social work and social pedagogy), CM is the common method of work triggered and induced by governmental laws and policies e.g. in Germany, the United States, and the Scandinavian states. In terms of treatment cases within the healthcare sector, where regular treatments are not success- or helpful, CM is used to identify groups of patients in need of specialized care [12]. As a result, it will be clarified below whether, based on the previous findings, CM in the social sector makes an IT support by ACM appear appropriate. Therefore, a designed-oriented information system research with inductive reasoning is conducted and discussed in the following [29].

There are two distinct layers applying CM in the social sector. The first one are the activities of the individual professionals during case work and then, on a higher layer, the second one is the coordination of the resources provided by the different involved professions – the CM process.

A suitable approach for describing casework in the social sector is Müller's circular four-level model [11]. It considers anamnesis, diagnosis, intervention and evaluation as essential activities of casework in the respective sector and is well suited for the argumentative ongoing of this research due to its low granularity. According to Müller's model, the individual steps of action do not follow consecutively in a linear order but should be able to penetrate each other and to start over again [13]. For this reason, problems can arise in rigid process sequences. The four-level model shows that steps that ideally should be processed consecutively are often erratic and concurrent. The knowledge of each social worker determines the further steps. Anamnesis, for example, is inevitably linked to the diagnosis, as an outcome is often anticipated, even without enough information. The process of accepting, conforming and defining a diagnosis proceeds practically parallel to the collection of information, but at different levels [11]. This statement of need for cooperative working in multi-disciplinary teams in terms of case management in the social sector is in line with current research approaches [30, 31].

In addition, the other resources that can be assigned to a particular case also influence the casework. Above all, the client himself, but also his environment and personal network are important and interesting for the case [14]. As a result, due to the subjectivity and variability of the environment, the casework processes are hardly structurable, thus hardly representable in models of activity, and consequently difficult to illustrate via ACM [32].

In contrast, the CM process, as a comprehensive control tool, prescribes a fixed procedure based on legal requirements for the management and coordination of case processing. A common procedure provides: *(1) determination of case groups / screening*, *(2) assessment / diagnosis*, *(3) planning*, *(4) implementation*, *(5) monitoring*, *(6) evaluation* and *(7) reporting* [15, 17]. The step (1) case group determination / screening serves determining characteristics that justify an application of the CM for a client and describes the similar cases (in terms of case groups). The screening then uses these characteristics to identify clients for specific case groups. The processing of the steps 2 to 6 is carried out according to the content of the four levels of the Müller-model mentioned above. In contrast to the description of casework, the CM process is not about individual work processes, but about the coordination and control of the activities of several professions in the case. For the adaption of this coordination task, the ACM provides the special role of a case manager [17]. For him, in order to be able to effectively carry out his work, the clear delineation of the individual steps is necessary. Nevertheless, these steps have to be run several times during the case implementation and, moreover, are subject to the variability of the environment. The final step (7) is to provide case-by-case documentation and review of the overall impact of the CM.

The description of CM in the social sector suggests a fundamental applicability of the ACM [32, 33]. The characteristics of the application area correspond to those described in section 2.1, which are identified as necessary – the area is collaborative, knowledge-intensive and there is no clear flow of control. According to the aforementioned definitions, a concurrent application in casework, where activities cannot be distinguished from one another, will be difficult. In contrast, there is a possible support for the CM process, which has a corresponding variability, requires collaboration and, with the determination of the case group as well as the accountability, contains a case-instance-overarching knowledge protection. While in the clinical sector, an IT support in terms of case management is mainly based on document management and providing the information necessary for coordination and planning [15], both data management and process control are absent in the social area.

3 Method Support for Adaptive Case Management

In order to describe the method support for ACM, the method model by Goldkuhl et al. [18] is used. Here, a method is a composition of so-called method components, where each component addresses a sub-problem of the method application. A method component describes procedures, concepts and a notation. In addition to these method components, a method definition also contains a perspective (in terms of problem definition and scoping), cooperation forms and a framework. The latter is intended for the use-control of the method components. With regard to ACM, the perspectives and concepts were presented according to the current state of science (section 2.1) and CMMN was introduced as a notation that scarcely considers other method components. To tackle this disadvantage, the process and role model by Hermann and Kurz [3, 19] is selected as appropriate for the method support. This approach contains the

peculiarity that it is based on the BPM 2.0 approach and adapted accordingly for ACM. Therefore, section 3.1 provides a brief explanation of the model and section 3.2 aims to adjust and extend the method for the social sector appropriately.

3.1 Method by Kurz and Herrmann

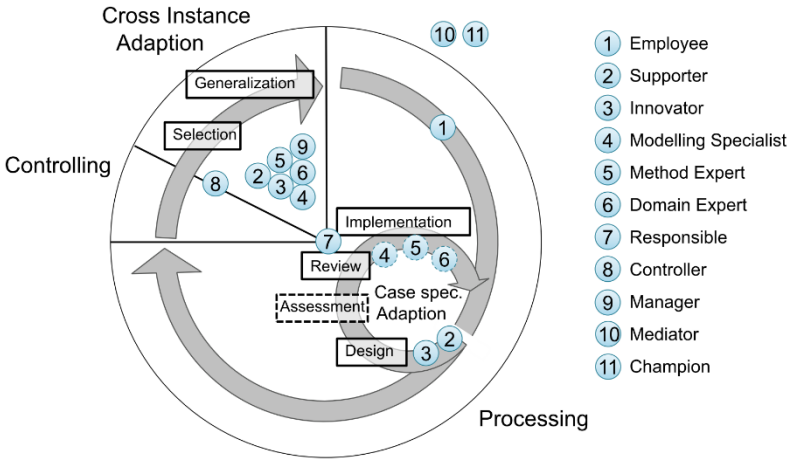

Fig. 2. Process and Role Model by Hermann and Kurz, adapted from [19]

The method is described based on a process and a role model (Fig. 2). The role model defines the responsibilities in each stage of the ACM process, defining a total of 11 roles. The procedure model describes the tasks involved in the ACM and their sequence: First, in the execution phase, the case template is selected and an instance is created. This is either adapted to the specific case requirements before or during case processing. This happens either with one or more iterations and contains the following advantages: First, a flexible approach to changing conditions and requirements is possible. Second, improvements can be implemented more quickly by limiting the scope of functions of individual iterations to be implemented. Third, the system is accepted better, by the users and by the management [3].

Corresponding adjustments within a case are either directly created by the employees (roles 1, 2 and 3) or developed collaboratively. In the further ongoing, suggestions for improvement are evaluated by the case officers (roles 6 and 7) and checked for correctness. If the approval (role 7) has been granted, the adaption will be implemented (roles 4 and 5). By considering the simplest case, this happens automatically, for example when creating a new process task. In some cases, additional manual development work may be required, such as the provision of complex functionalities [3]. In the control phase, as soon as the case objectives have been completed and the case has been closed, the achievement of objectives and the efficiency of the case are assessed. The changes made as part of the case-specific adoption are also evaluated (roles 8 and 9). If sufficient information and approaches for improvement exist for a case report,

these can be generalized and made available in the case-by-case adaption for use in future cases. Individual case components or entire case templates and components can be adapted or stored separately as specialized variants [3]. The mediator (role 10) interferes in conflicts, while the champion (role 11) serves as a supporter of the ACM in the company [3].

3.2 Method Evaluation and Enhancement

To validate a possible suitability of the Kurz and Hermann method for the social sector, a behavioristic approach via qualitative expert interviews as a cross-section analysis [29, 34] were carried out. As stated in the introduction, this research aims to propose a method component that creates initial case templates and defines case objectives. In general, the method by Kurz and Hermann is appropriate for an application in the social sector, but contains some weaknesses. First, a high level of complexity of the proposed procedure for adaption before or during the case processing is determined, whereas a detailed evaluation of individual method components was not carried out. Second, the implementation only required the basic suitability of the companies' workflows for process management. Third, method components are also not specified to the extent that processes within them can be described concretely; the process model rather presents a framework. Fourth, with regard to the role model, the basis is created to define forms of cooperation, but these are also not specified. Fifth, there are no method components that describe how cases are identified (see (1) Case Group Determination / Screening section 2.3) and how initial case templates are created. Sixth, the modeling of the case objectives is defined unclearly, the frame model of the case manager (section 2.3) is not depicted and the role model is too complex to be practicable in small companies.

In order to encounter these deficiencies, expert interviews are conducted in order to obtain appropriate information, which accordingly extends the Kurz and Hermann method so that it is most suitable for use in the social sector. In the sense of purposive sampling strategies according to Palinkas et al. [35], collaborative, guided interviews were chosen as means for data collection. The method expert processed them (role 5) with employees (role 1) and associates responsible in dispositive functions (roles 8 and 9) in order to use different, company-internal views for case processing. Concerning the determined procedure of the interview guide, it is based on Prenner [20], who deals with tools for recording business processes through interviews in his research. In addition, the research of Trinczek [21] was used to design the process modeling questions.

Table 1 presents the key questions for the interview. The first and second question *What is your profession?* and *What are your duties?* are inherited from Prenner. The third question *When a client contacts you, what is happening then?* descends from Penner as well and has been formally adapted. The fourth question *What activities are being performed, by whom and where?* is a combination of three central questions from Trinczek [21]. The original questions are: *What is done? (activity)*, *Who performes the activities? (role / person)* and *Where are the activities performed? (location / organizational unit)*. With the question *Which tools are needed?*, the fifth ques-

tion is developed based on Trinczek and slightly extended. The sixth question is also inherited from Trinczek. The questions seven through ten are case-study-specific, as questions seven and eight delineate the approach from traditional BPM. The questions aim at starting activities that are performed outside a defined control flow. Question nine addresses the goal orientation, the project character of case processing and the identification of important case objectives. The tenth and last question has a controlling and complementary effect on the documentation and should give the person interviewed the opportunity to provide additional information, which are not triggered by the previous nine questions.

Parallel to the interviews, sketches are made with all tasks and individual relationships. These provide a better overview during the interviews so that interviewers and respondents do not lose track. The sketches are based on a simplified notation (figure 3) that is based on CMMN. This simplified notation allows to collect tasks and milestones in order to keep track of process goals and how they can be achieved by task execution. Instead of complex constructs to control the execution of tasks, freely named relations are used in order to collect dependencies between tasks and if possible semantics of these dependencies.

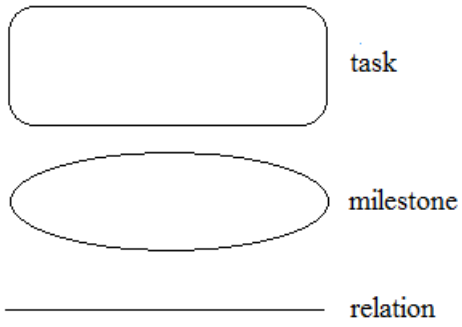

Fig. 3. Notation for the case description during the interviews

In order to exclude influences of prior interviews, each interview starts with a new sketch. After performing the interviews, a case template in CMMN notation is created by the method expert.

Table 1. Interview – Guiding Questions

Question	Comment	Goal
1. What is your profession?	Determine name of profession	Starting conversation
2. What are your duties?	Determine work areas	Identify all responsibilities of the employee
3. When a client contacts you, what is happening	Procedure of case handling	First impression of case handling. Is there a de-

then?		fined control flow?
4. Which activities are performed, by whom and where?	Reveal responsibilities, activities and processes, local orientation	Identify all relevant activities of a case and determine the location of performance
5. Which tools and preliminary work is needed?	Determine trigger and relations	Understanding of triggers and relations between activities in order to find sequences
6. What are triggers for the activities?	Determine trigger and relations	Understanding of triggers and relations between activities in order to find sequences
7. Which activities can be performed at an arbitrary point in time?	Activities that are outside a defined control flow	Show independent activities
8. Which activities need to be performed at or until a certain point in time?	Activities that are outside a defined control flow but bound to temporal requirements	Identify temporal requirements of the case and further specify relations between the activities
9. Which milestones can be defined for the case?	Milestones help to control progress in case handling	Definition of milestones and hence case objectives
10. Are there activities or relations that have yet not been mentioned?	Reassurance of the modelling result	Correctness of the resulting model

4 Case Study

The case study (in terms of case study based research design) was conducted in cooperation with the GeBEG, the society for child upbringing, health and education Rostock. Mainly, the company works with families, parents, children and the youth welfare office. Together, the case *assistance for child upbringing* was selected for modeling. Therefore, four GeBEG employees were interviewed with the methodology described in section 3.2. Three of them were social workers (role 1, section 3.1) and one of the four company's leaders (role 8 and 9). The method expert (role 5) is external to the company in this case. The formal role of a case manager (section 2.3) did not exist in the GeBEG, as the cross-profession coordination is provided by the youth welfare office. Following the third interview, it was no longer possible to identify any tasks that were not mentioned yet. The result is presented in the description of the case (model in figure 4).

Most of the activities have no predefined procedure or order. There are fixed activities and processes, but these relate to specific requirements or specifications by the authorities. Other crucial activities and processes often only emerge spontaneously, for example by getting in contact to one or more clients. Through permanently changing circumstances, many cases differ from the general case. This makes it difficult to

substantiate the general tasks for a case. Strong external and internal factors can change processes quickly and often.

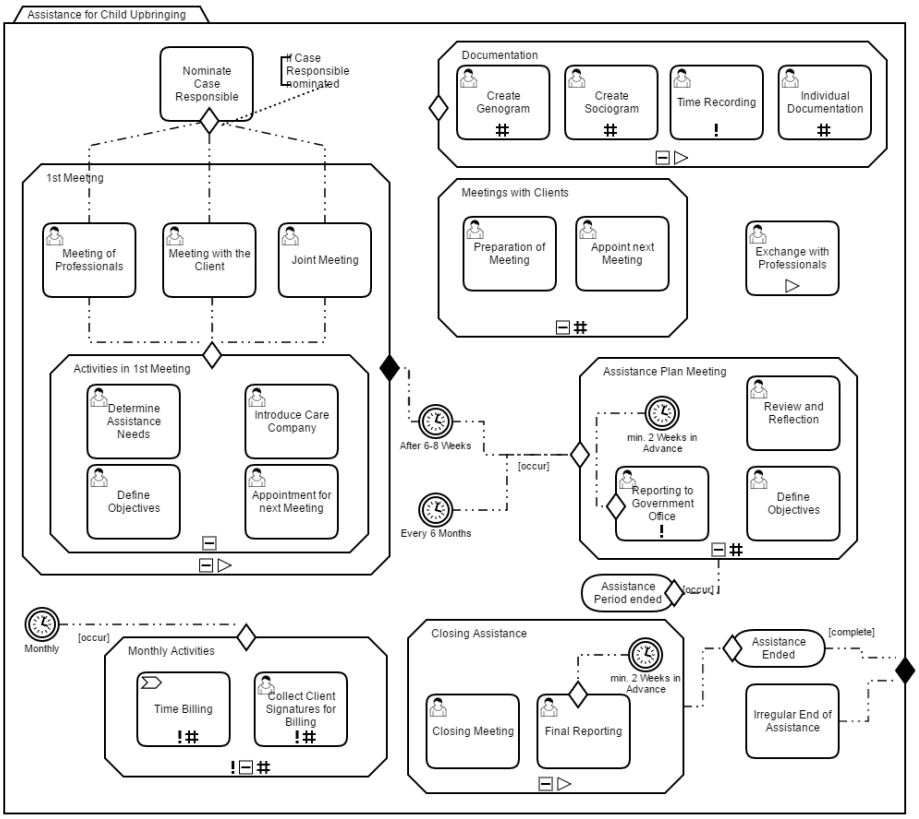

Fig. 4. Case Template "Assistance for Child Upbringing" in CMMN

In general, all four interviewees described a similar procedure (case template in figure 4). They stated that the work process started with a first conversation. There are various combinations of participation among the involved parties. Either the first conversation takes place only with the professionals (youth welfare office and GeBEG) or with the professionals and the clients (all participants) and, as a third option, the talk takes place between the GeBEG and the client. In this first conversation, all participants should get to know each other better and the client's family decides whether they want to accept help from the social worker or not. In addition, if help is appreciated, the content of the help program and corresponding goals for it are defined. Therefore, two of the four interviewees created a genogram (or sociogram) to get a better overview of the case. In the course of the help process, appointments take place, which have to be documented and deducted. Every six months, a help plan discussion takes place with the youth welfare office. Two weeks before this help plan discussion, the carrier report must be submitted to the youth welfare office. During

this conversation, the bygone help period is evaluated and, if necessary, goals are set for a further period. All interviewees indicated on demand that this six-month cycle between the assistance plans is a formally order. During the interviews, it turns out that there is no real conclusion of the case, as long as the help continues. However, the client or the GeBEG can terminate the help program at any time.

As a result (figure 4), it became apparent that many supporting activities were modeled (to make an appointment, to document, to account the time needed). The issues of anamnesis, diagnosis, intervention and evaluation from the model according to Müller [11] are indirectly reflected. For example, elements of the anamnesis and diagnosis can be identified in the first conversation. In addition, the help plan discussion with the aspects of retro perspective and reflection also contain evaluation aspects. The documentation then externalizes the results of the case instances and thus contributes to the reporting goals, which is done by describing the CM process according to section 2.3. The intervention takes places in the task *dates with clients*, but is not further specified there. It also determines that the CM process, which requires documentation, influences the casework.

The CM-process in particular involves different organizations and organizational units. Thus, it cannot be modelled by a single organization (unit) using the existing method support. Although there are approaches to inter-organizational ACM by Hildebrandt et al. [22] and Kurz [23], but these researches mainly focus on a notation for processes and the assurance of solid process models when modelling in a distributed manner, whereas method components for process elicitation are not considered. Furthermore, with regard to an appropriate notation, organization models might be required.

The definition of case objectives is not examined adequately so far. The suggestion by Kurz et al. [5] to introduce milestones to CMMN has been implemented in the current CMMN version. However, the case objectives are domain specific and, regarding this research, the interviewees were not able to define milestones for the case study. Furthermore, objectives may change during case handling, e.g. due to important changes within the social environment of the client. In general, the achievement of case objectives should be traceable by case data since case control is data centric and this could lead to improvements in other cases. Hence, data models should be included in case modelling methods.

5 Summary and Outlook

This research is concerned with the question of whether adaptive case management is suitable for implementation in social institutions. To this end, the central principles of ACM were first presented, a distinction from BPM was made and methodological support with extensions was depicted. In the following, this method was tested by means of a case study.

Regarding the overall achievement of the objectives, it can be noticed that, in relation to the basic principles of the ACM in combination with the enlargement and the findings of the case study, there are indications that it is useful to apply ACM in the

social sector. In addition, the case study has shown that there are opportunities to present social processes as case studies.

With regard to the evaluation and further development of the ACM for the social sector, case modelling method components were designed (section 3.2) and successfully applied, at least with regard to the consulting case model of the study. According to the explanation of model weaknesses in section 3.2, further research is needed to generally:

- reduce the burden of case adjustments,
- make role models less complex, as well as
- design a method component that allows the identification of cases.

In the special context of social institutions, investigations are necessary concerning:

- adequate support of definition and control of case objectives,
- refinement of the role model for appropriate fitting to the roles of CM, as well as
- designing a method component for inter-organizational case models.

In the context of the practical application, the step 1 (case group determination / screening, section 2.3) was deliberately omitted since validation in the context of the case study (section 4) would not have been possible. Although the GeBEG GmbH knows and uses CM, the participants did not consider a distinction of case groups meaningful. It also shows that not all processes or tasks are suitable for being presented as case models, although they are core tasks of the company under consideration. This can be explained by the high dynamics of these processes and tasks. At this point, further research would be helpful regarding how quickly changing processes and tasks can be represented well with a corresponding notation as well as a validation of this research's findings.

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