Using CMMN to Model Social Processes

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Abstract. Adaptive Case Management is an alternative approach to support human-intensive processes. It may be served by Case Management Modeling Notation (CMMN) language for modeling purposes. In this paper, ACM concepts are adopted to support human-intensive processes executed in social environments, referred to as social processes. As a first step, the usage of CMMN language is explored to model them. Corresponding CMMN social processes models could be executable within a social network platform. For this purpose, ACM meta-model is extended to incorporate execution properties within a social environment. To demonstrate the potential of the proposed enhancement an example of a social process is used as a case study.

Keywords: Adaptive Case Management
Case Management Modeling Notation · Social BPM
Human-centric processes · Collaborative processes · Executable models

1 Introduction

Adaptive Case Management is a data-driven methodology for business processes targeting human-centric processes and considers data creation and data exchange as the center of its designing philosophy, rather than the process itself [23]. This methodology uses the created case data that may lie even in case actors email inboxes [19], as useful knowledge about the case, in order to support the knowledge workers [20] in decision making. Thus, ACM is supportive and human-centered as its main initiative lies to facilitating the involved participants as well as agile and adaptive as a methodology, especially because it provides an organization with the ability to change according to its needs, a feature that is essential in continuously changing human-centric business domains [26]. However, dependence on changing data and other (possibly unknown) circumstances makes automated support for case management processes extremely challenging [24].

On the other hand, social platforms promote the collaboration between actors and may provide a powerful environment for the execution of human-intensive processes [7], since they provide the means for exchanging messages, create and share data, as well as, keeping track of all the activities belonging in an interaction stream [4]. ACM could be considered to support collaboration between

knowledge workers within a social network platform, as proposed in [17]. However, is it possible to model human-intensive processes executed in a social environment, referred to as social processes, using standard corresponding notation languages? Case Management Modeling Notation (CMMN) proposed by OMG is designed to serve ACM, in a similar manner as BPMN serves BPM for modeling purposes [14].

The goal of this paper is to examine whether CMMN could be effectively used to model social processes. Furthermore, small extensions of corresponding ACM meta-model are proposed to enable CMMN social process models to become executable in a social network platform.

In Sect. 2 of this paper, related work is presented. Section 3 projects the Adaptive Case Management extension through the addition of social characteristics into its core meta-model. Additionally, a social process, namely ReWeee electronic product exchange process, is used as an ACM example. Section 4 presents how the extended meta-model for ACM can be expressed through, utilizing the Case Management notation for the design of ReWeee process. The final Section refers to the conclusion that can be drawn including any added value created from this research work, as well as some future challenges set by the authors.

2   Related Work

The theory of ACM seems to have a continuously growing reputation and competitiveness as far as the business process modeling approaches is concerned, a fact that justifies its growing establishment in research. Thus, it is important for ACM the fact that CMMN has to be widely adapted.

For that reason the CMMN standard defines a common meta-model and notation for modeling and graphically expressing a Case, as well as an interchange format for exchanging Case models among different tools [21]. This specification is intended to capture the common elements that Case management products use, while also taking into account current research contributions on Case management [21]. Based upon this specification for Case Management, several research attempts were made, casting their focus either upon the analysis of the Case Management Specification [6,9,10,12,15], or upon extending and improving this specification [5,25]. However, it still seems to lack in execution effectiveness, especially as far as automation in run-time phase is concerned [8,16,24].

This later argument arises from the fact that different ACM modeling tools had been developed to support this theory, in addition to ACM platforms that had been designed, implementing the core philosophy of this approach. To be more specific, several ACM-empowered platforms and modeling tools exist, such as Cognoscenti, an experimental system for exploring different approaches to supporting of complex, unpredictable work patterns [27], a collaboration platform for ACM as designed and presented in [11], a wiki-based ACMS named Darwin Wiki [13] which empowers knowledge workers with limited modeling capabilities and introduces inference opportunities for structured attributes of

a case [28] and ISIS Papyrus [1]. Additionally, the fact that Oracle with Oracle BPM Suite for ACM [2] and IBM with Case Manager tool have implemented suites that support ACM methodology enhances the argument that it is an established approach.

However, the above mentioned platforms and tools cannot be considered as standardized and compliant with the theory of Case Management. The main reason behind this assumption lies to the fact that there is no common view for these tools and platforms and there is not a common graphical language that these tools and platforms can be based upon in order to support adaptive process design and modeling. Thus, what is required is a more standardized concept for ACM and Case Management theory in general.

To this end, the authors of this paper propose an extension to Case Management, by infusing social characteristics into the methodology of ACM, inspired from Casebook [17], which combines the main Case Management elements with social features. To be more specific, Casebook was chosen as it embraces social and collaboration technology, analytics, and intelligence to advance the state of the art in case management from systems of record to a system of engagement for knowledge workers [17]. Moreover, Casebook's main capabilities include case planning, execution and assistance, measuring and learning, and a community-curated case catalog, alongside with the fact that it enables collaboration among case workers to facilitate case resolution in a social environment [17]. Thus, what is inspiring about Casebook it the fact that it implements all the essential ingredients of effective execution of human-centric models.

In this paper, the applicability of the CMMN standard upon social-driven, human-centric processes is examined, as well as the way in which CMMN as a modeling standard can be valuable in modeling a social process. This attempt consists of two stages. The first one includes the infusion of ACM with minor social enhancements in order to enable social processes support, while in second stage what is examined is whether the execution of ACM models was facilitated or not. A benefit from this convergence is the fact that collaboration, which is characterized as a vital ACM feature ([26] in [11]), as it allows actors with suitable expertise to advance the case or provide information which can help to advance the case [25], can be enhanced in a social and knowledge intensive environment. Additionally, what else can be emphasized through this is the event feature. That way, efficient automation levels can be established for a case as an event can express in a more abstract manner the conditions under which an action should be initiated [3].

This way, a social-driven approach of Adaptive Case Management is proposed. It is expected to be implemented within the context of Social Adaptive Case Management, a notion that already exists in research [18,22]. This alteration of ACM, supported by CMMN, seems effective in modeling human-intensive processes especially, when the executable CMMN models are to be automated and executed within social environments.

3   Extending ACM Meta-Model with Social Features - A Case Study

Is ACM the proper paradigm to model social processes? The authors wondered on this issue when tackling with the ReWeee collaboration process. This collaboration process lies within the framework of the LIFE ReWeee Project, and the scope of the ReWeee web-based collaborative platform, that has as main goal to facilitate and promote Electrical and Electronic Equipment exchange and donation among households or households and public/private bodies. Its success lies within the social communication between volunteers and their collaboration in order to achieve the best possible result.

3.1   ReWeee Social Process as an ACM Example

ReWeee social process allows volunteers to exchange electronic devices through a social network platform, namely the ReWeee platform. Below, a use case diagram of the ReWeee process is presented (Fig. 1). In this, a generic view about both the user categorization is projected and a summary of the primary actions that each type of user can take during the process.
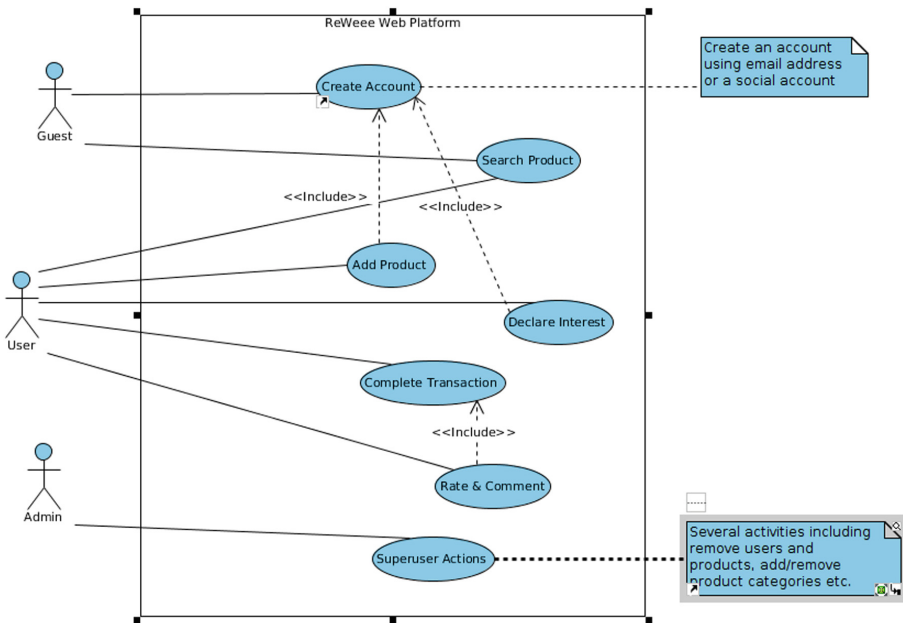

Fig. 1. The ReWeee process use case.

As far as the categorization of actors is concerned, there are three types of users. These are guest users, registered users and administrators, that differentiate themselves as far as their granted permissions upon the use of the platform is concerned.

More specifically, when any unregistered user visits the web platform for the first time, he gets prompted to register into it, by creating a user account. This account can be created either as usual, namely, by signing up via an email and a password or by signing up via a social network account, as well as giving to the platform the necessary permissions for using personal user data. After a successful registration, the, from now on, registered platform user, is able to submit an advertisement donating or exchanging an item, to declare interest for an existing product and propose an offer to acquire it, as well as to communicate with any other user who owns a desirable electric device.

Moreover, a registered user is not only able to search a product based on some conditions, namely, filters like item categories, item state, donating-user region, but also to either suggest changed regarding the item's category for which he is searching, or even to comment in any advertisement that he had made use of. That way, either the platform administrators or the appropriate users will be notified for either the category change proposal or the commenting in an advertisement.

Finally, registered users have a profile in which they are able to be notified for any recycling actions taken via a news-feed as well as being informed for general topics regarding recycling and its benefits. Within each user's profile, a calendar exists via which a user can be informed for any recycling events taking place.

3.2   ACM Meta-Model Extended with Social Features

In this subsection an extended meta-model for ACM is provided as it is projected below (Fig. 2). Based upon the CMMN standard the authors kept ACM main features unchanged, namely, the "Case" and "Task" elements. These Case management features represent the main characteristics of a human-centric environment as it includes cases that need to be handled properly, while it additionally includes, the appropriate human tasks assigned to the involved actors. These elements, alongside with "Data Object" and "Sentry" elements inherited by the CMMN notation are considered as the key features of the ACM meta-model extension (Fig. 2). What is more, a "User" element was inserted to the meta-model replacing the "Role" element that existed before, as a specialization of the involved actors, with the characteristics and actions of a social process user (communication, notifications, publishing).

Moreover, "Data Object" element do not replace the Artifact element which exists in the ACM meta-model [23] but it is inserted into the model as a more general notion of data created during the case execution. For instance, in a daily registration of patient's data, there could be important information, or plain data about his/her case.

What was the most important change into the ACM meta-model [23] was the substitution of the Roadmap element with a more general notion, the one "Sentry", inherited from OMG's CMMN standard [21]. More analytically, the Sentry element was highlighted as it represents a combination of conditions and events that define the sequence of tasks to be implemented, alongside with the roles involved in the case execution and is divided into two parts (states). The first

one, the "if part" represents a condition that needs to be satisfied in order to both lead to the second part, the "on part", that describes the event that itself will trigger an action, either a notify activity or a publish activity, and consider any case milestone as a reached one.
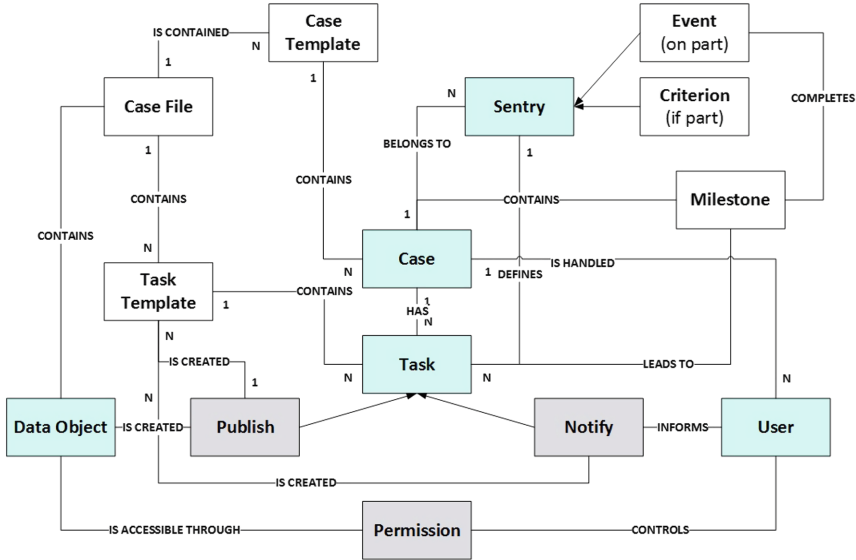

Fig. 2. Social-extended ACM meta-model

Moreover, the task and case templates were retained into this model as well. These elements represent the knowledge attained by the involved actors in any human-centric environment over the completion of similar cases. The data structure that contains all the data objects created for the case as well as the templates for tasks and the case itself, is named as Case File a notion that it was inherited from the CMMN standard and the main theory behind Adaptive Case Management.

However, despite the fact that the Task element was retained into the extended meta-model, it was also divided into two basic categories of human actions, the "notify" and "publish" actions, each one of them has a different result into the case execution. To be more specific, the "notify" action leads to the notification of the appropriate actor, which is to trigger the next user event, so the next appropriate action to be taken, as a result from a previously created task. On the other hand, the "publish" action is the one that is creating, updating or using artifacts and data for the case executed, data that are saved into the case file as data objects. The reason behind this extension of the Task element lies to the fact that these tasks are the most common human tasks to be executed in a social environment, as notification of involved actors and publishing of data can be characterized as a daily routine of social interaction.

Additionally, the "Permission" element was also inserted into the extended meta-model. Permissions were added to separate the access level that each case role has into the case files and useful data objects. It also describe the separation of users in categories within the collaborative ReWeee process, always having in mind the social environment in order to promote the automated execution of CMMN diagrams.

In the following (Table 1), we explain the way each meta-model element is used to describe the ReWeee social process as well as how each one of the Case Management extensions proposed, enhances the overall process. For this purpose, the below projected table was created, in order to match ReWeee process features with ACM meta-model elements.

Table 1. Meta-model elements applicability in the ReWeee process

Meta-model elements	Social and collaborative platform
Data objects	As far as data are concerned, what is stored in the platform are user platform data (uploaded products, region, rating), product data (category, state, quantity, type)
Publish tasks	Publish Tasks are performed during user registration, when user data are saved, or when a new product is offered in the platform and its details are being stored
Notify tasks	Notify Tasks are performed by the time a product state change takes place. For instance, when a user declares interest for a product, its owner gets notified
Users	Role categorization includes two different types of platform users and a platform administrator. These differentiation in roles is used for better user permission handling
Sentries	Sentries take place to the platform mainly when a decision is made. Moreover, sentries happen when user publishing and notification events are triggered
Events	Events are triggered when a user declares interest for a product or rates a product transaction. Then the appropriate users get notified for any product state change
Permissions	Permissions are granted to each user according to the category it belongs to. Different types of users have different types of permissions and different usage restrictions
Milestones	Milestones describe any activity that, when accomplished, causes a process state change. In the ReWeee process, a successful transaction could be defined as a milestone

4 Modeling ReWeee Social Process Using CMMN

In CMMN, ACM data objects and case artifacts are projected as CaseFile items, representing a piece of information of any nature, ranging from unstructured to structured, and from simple to complex [21]. On the other hand, tasks are handled as an atomic unit of work and are divided into different task types, namely, human tasks, process tasks or decision tasks. Sentries as a combination of an event and a condition (criterion) are not used as a standalone CMMN element. At first sentry criteria are used, categorized into two different types, entry and exit criteria of a sentry. Secondly, events are displayed and described into the CMMN standard as anything that can change the case state as far as either the case data or the sequence of case stages, case tasks or case milestones, is concerned, and are divided into two different types, as timer events and user events. Additionally, a milestone represents an achievable target, defined to enable evaluation of progress of the Case. No work is directly associated with a Milestone, but completion of set of tasks or the availability of key deliverables typically leads to achieving a Milestone [21].

4.1 A CMMN Model for the ReWeee Social Process

Having the main executable elements of the extended meta-model for ACM methodology linked with CMMN and described as Case Management entities, it is about time to make a modeling attempt of the ReWeee collaborative process, as the final act of transition from ACM to a social perspective or Case Management. For this purpose an open source CMMN modeling tool was used, Camunda Modeler modeling tool. Mainly, this tool was chosen because of its ease of use, its multi-platform availability and the fact that CMMN was directly available as a modeling language in this tool, without any need of parameterization.

ReWeee social process consists of the main human tasks that a ReWeee platform user can make during his/her interaction either with the platform itself or with other platform users. Having that taken as a premise for the CMMN model that was required to be designed, the below displayed Case Management model was created (Fig. 3) for the ReWeee social process, containing also for the appropriate task elements the notion of stereotype task, marked either as "publish" task or "notify task" as introduced in Fig. 2.

The first human-centric activity that a registered platform user can do is to view the created profile, alongside with whatever this activity includes (i.e. read messages, view notifications). Furthermore, from that point, users can take different human tasks such as searching for a product into the platform database, placing their own adverts of donating or exchanging equipment and directly communicate or interact with other platform users (place comment, submit rating).

If a user decides to place his own advert for an EE product, then this task has some characteristics except from being marked as a "publish" stereotype. Firstly, it has an entry criterion of an existing user profile, namely, no unregistered user can use the platform to place a product advert. Secondly, it has an exit criterion which creates the following case elements. It not only creates data

objects containing information about the newly submitted product, but also the case milestone of the product publication is reached alongside with some notification events that happen based on some conditions. The first one is to have an exchange advert published, namely, a product is proposed for exchange with another product previously published in the platform. Thus, the owner of the previously published product is notified that there is interest about his/her advert. The second is a notification event triggered to users that have the newly published product on their wishing list and have them automatically notified that there is one available.
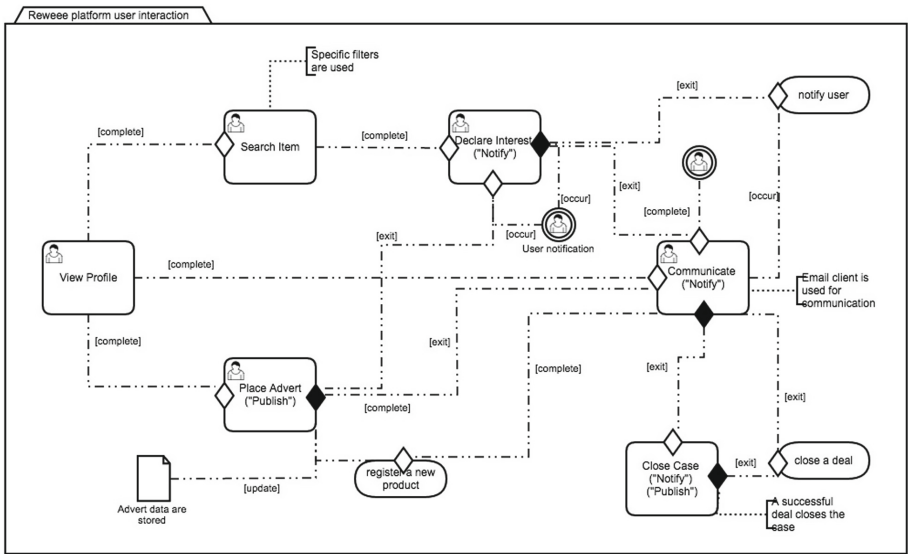

Fig. 3. CMMN model for ReWeee social process.

If the first one, the "product search" task is chosen, except from the entry criterion of an existing user profile, the user sees a list of available products referring to the filters applied, from which a product can be chosen for viewing and from this point he/she can declare interest upon that. That describes another human task marked as a "notify" stereotype that can be taken within the ReWeee collaborative process, the one of "declare interest" which also has some characteristics. Firstly, there are two separate entry criteria that are independent to each other. The first one, is the entry criterion of having searched a product in order to view it and declare interest for it, while the second one refers to the entry criterion of having placed an advert for product exchange which contains interest declaration of another product. Independently of these entry criteria, this task triggers a user event of notification to the product owner about which there is declared interest, after its exit criterion is satisfied. It, additionally, not only leads to the "communicate" human task marked as "notify" stereotype, but also after its execution, the process reaches the milestone of platform user notification.

Finally, if the communication task is chosen or triggered then an collaboration subprocess is initiated, alongside with continuous notification events for new incoming platform messages. More specifically, this task contains entry criteria of having interest declared for a product, having a registered user profile and have an advert place for a product. This human task's exit criterion is satisfied, then the "close case" task is triggered marked as both "publish" and "notify" stereotype that has as entry criterion a successful communication between platform users, and its exit criterion completes the milestone of closing the case, namely, the transaction for a product.

4.2   Discussion upon ReWeee Process CMMN Model

ReWeee process modeling using CMMN was a straight-forward task. There was no difficulty for the modeler in understanding the transformation of the abstract notions described into the extended ACM meta-model (Fig. 2) to related CMMN elements.

The use of task stereotypes promotes automation within the process, as it gets easier for a CMMN modeler to link these two stereotypes, namely, "publish" and "notify" labels, with specific following actions into the process life-cycle, or even with the triggering of specific events that can change the process state. Furthermore, the use of stereotypes promotes the notion of "publishing" information, which is considered as a vital activity in social environments as well as a basic feature of Adaptive Case Management theory.

Finally, the benefits of milestone and sentry elements included in the model of ReWeee process should be highlighted. The use of milestones and sentries provides a process designer with the ability to control the flow of the social process. Moreover, it gets easier to put restrictions to the process execution to make its implementation more efficient, while it helps process modeler to make the process representation more descriptive.

5   Conclusions and Future Work

The adaptation of CMMN language to model social processes was explored in the paper. The ReWeee collaboration process was used as a case study. Corresponding CMMN social process models should be executable ones and may be implemented within a social platform environment. As a first step, we discussed some minor extension of CMMN and the corresponding ACM meta-model to serve ReWeee process in an effort to establish executable social process models.

Regarding CMMN adaptation, we concluded that the social infusion of Adaptive Case Management leads to an enhancement of the collaboration between the involved case actors, a fact that facilitates automatic scheduling and design of a human-centric process. Furthermore, despite the fact that ACM may seem unstructured, with the appropriate event handling, a decent level of automation can be achieved. Finally, a future challenge for this work could be set so as to have an executable version of the above projected collaborative process model in order to have the presented extension of ACM, implemented.

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