Stroke management: Defining and assigning goals to stakeholders

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Abstract

Some organisations have high level objectives to meet but need a way of knowing how. We present here an application of a previously published method to a medical case study. This method consists in assigning sub-goals of a high-level goal to the actors of an organisation in order to guarantee the satisfaction of the high-level goal. The application is organised in a modelling session with a domain expert and produces goal models. Feedback from the domain expert on the method is proposed.

Keywords

goal requirements, goal elicitation, goal modeling

1. Introduction

When a patient receives medical care, many different actors are involved for providing the best possible care. Each actor is part of the continuum of care and may act at different times and for different reasons. They must therefore adapt to each patient's situation and to the actions that other actors have taken or will take in the future. Because of the complexity of the interactions between the different actors and the technical nature of the care professions, it can be difficult to have an overall view of the objectives of each actor and to understand how these fit into the overall objective of patient care. Traditional methods such as lists and brainstorming are quickly outdated in such a complex situation. In this article we present the application of a method for eliciting and refining goals to a medical case study : *optimal management of stroke in adult patients* The method is presented and applied on aeronautical case study in [1]. It consists in refining an abstract *High-Level Goal (HLG)* that an organisation wants to satisfy into concrete and satisfiable goals. Each concrete goal is assigned to an existing actor in the organisation who is capable of satisfying it. Furthermore, the satisfaction of all concrete goals ensures that the HLG is satisfied. The method is based on the knowledge and know-how of a domain expert as well as goal modelling. We have worked with a domain expert who is a medical doctor with four years of experience in physical medicine and rehabilitation. The model expert is one of the authors of this article. The physician's objectives are (1) to obtain a clear graphical model of a

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patient's journey and (2) to identify the range of care needed to manage a stroke. For academic side, the objectives are (i) to test whether the method can be generalised to an area of case study different from previous applications and (ii) to produce goal models validated by an expert in the field of study (*i.e.* they are accurate representations of the situation studied).

2. Method presentation

In this section, we briefly introduce the method presented in [1] and adapted from [2]. We start the method with an HLG and a set of actors from the organisation. All the actors in the organisation want to satisfy the organisation's goals and are looking for a way to do so. Then, the HLG is translated into a goal and assigned to an actor in the set. The goal is analysed with respects to the skills of the actor and then *refined* into two sub-goals: g_a which contains the part of the goal that the actor can satisfy, and g_b, which contains the rest, such that satisfying g_a and g_b induces satisfying the initial goal. The goal g_a is held by the actor and is labelled *satisfiable*, meaning that the actor can satisfy it. The goal g_b is *delegated* (*i.e.* given) to another actor of the set. This new actor is now solely responsible for satisfying g_b. Thus, g_b is examined with respects to the skills of this new actor, and the process is continued until all goals are labelled satisfied. All actions (refinement, delegation, labelling) are decided by the experts who are part of the decision-making entity *Global Manager*. This method was previously applied to three HLGs of an aeronautical company.

3. Working sessions

We organised the method application with the domain expert in three workshops conducted by videoconference. The first session lasted 30 minutes. The aim of this session was to unfold the algorithm with the domain expert acting as *Global Manager*. During the session the model expert used a free hand drawing tool and the domain expert did not have access to this model. At the end of this session, a first model was built. The second session, also 30 minutes long, was aimed at reviewing and consolidating the model obtained in the first session. The focus was on improving the wording of the objectives and clarifying some medical domain aspects. At the end of this session, the initial model was complete and the goals were clear and unambiguous for all participants. The third and final session of 10 minutes was dedicated to the final validation of the model. This session provided an opportunity to reach consensus on the final model, taking into account any suggestions for improvement made by the domain expert. During the last two sessions, the domain expert had access to the model, but modifications were only made by the model expert.

Between sessions, questions were exchanged by written message. At the end of the three sessions, the domain expert was interviewed to gather her impressions of the models obtained.

4. Resulting model

The final goal model is presented on Figure 1. The initial goal is *B0 : optimal management of stroke in adult patients*. A stroke is an interruption of blood flow to part of the brain and can

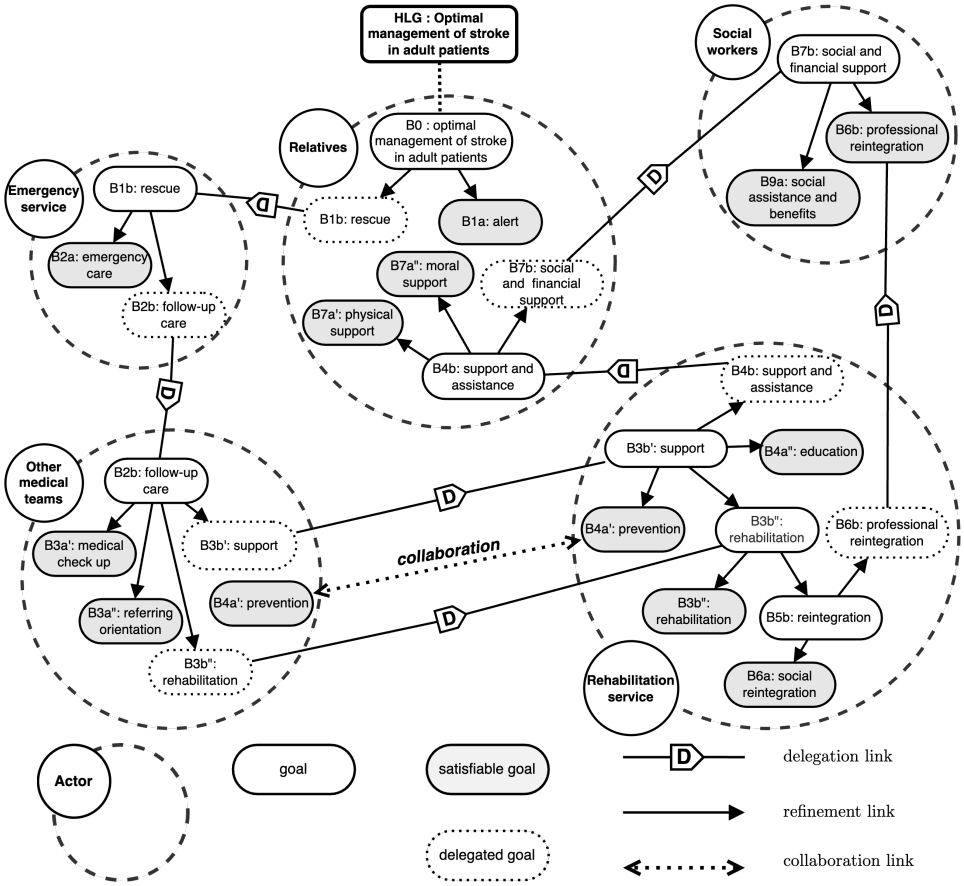

Figure 1: English translation of the final model obtained for the HLG *Optimal management of stroke in adult patients.*

cause irreversible damage to the brain, leading to motor, cognitive impairment and even death.

At the beginning of the method, the *Global Manager* decides to assign this first objective to the *Relatives* actor. *Relatives* does not have the skills to fully satisfy the goal, so the *Global Manager* chooses to refine it into two goals: *B1a: alert* that *Relatives* can satisfy, so it is labelled *satisfiable* and put in grey in the model. The second objective is *B1b: rescue*. As *B1b* contains elements of *B0* that cannot be fulfilled by *Relatives*, *B1b* is delegated to another actor, *Emergency Service*, chosen by the *Global Manager*. The algorithm is pursued. At the end of the method, five actors have received at least one goal : *Rehabilitation service*, *Relatives*, *Emergency service*, *Social Workers* and *Other medical teams*. Twenty-eight actions have been done including labelling *satisfiable* for twelve goals.

5. Feedback from the domain expert

The domain expert appreciated the method concepts and more specifically the *delegation* mechanism. In her opinion, *delegation* highlights the importance of each actor in the care

pathway, while emphasising the notion of continuity and collaboration in their role. In addition, *delegation* emphasises the transfer of responsibility for achieving objectives between different actors. In this application, that responsibility is patient care. These two aspects of *delegation* were seen by the expert as strengths of the modelling approach used. However, the domain expert points out that the method *"segments things that are not so segmented in real life"*. This segmentation is particularly significant for goal *B4b": prevention* which is performed in real life by both *Other medical teams* and *Rehabilitation service*. In order to express this very strong collaboration between the two actors, we have added a *collaboration* link in the final diagram.

Both objectives of the domain expert are satisfied at the end of the application. About objective (1), the domain expert mentions that these models could help to improve people's understanding of the system. In order to help this objective, a simplified, colourful models and explanatory cards are provided to the domain expert at the end of the sessions. These elements can be used as communication tool to a large public. In addition, the expert mentioned that using the algorithm enabled her to elicit goals better than traditional methods. Which means that objective (2) is met.

6. Conclusion

This application allowed us to test our algorithm in a medical context, with a real organisation and an expert in the field studied. It was a completely different domain from our previous aeronautical applications. Nevertheless, the method was still globally adapted and allowed us to build a goal model of the situation under study. The objective (i) consisting in testing the method on a different domain can thus be considered achieved. The final models are validated by the domain expert who wants to use them professionally. Objective (ii) is therefore met.

However, there were some deviations from the original algorithm over the course of the sessions. For example, some refinements were made in more than two goals, or they followed each other without any delegation. It was also sometimes difficult for the domain expert to distinguish between refinement and delegation, and the division of time. These points need further investigation and could contribute to the development of our method and algorithm.

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