Modelling telecare service requirements for older people using the Unified Modelling Language

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Abstract. Providing technology support for older people offers distinct challenges for social and IT systems delivery. The definition and integration of services, the diversity of supply, variance in structures, and the lack of centralised control, introduce significant challenges. These challenges stretch contemporary methods in the social and IT domains. In this paper, we introduce a method that we have developed and used successfully over a number of years. We briefly introduce a protocol and framework that utilises the Unified Modelling Language and adapts best practice from methods such as the Unified Software Development Method, the Dynamic System Development Method, and user-centred approaches from the care sector such as Userfit.

1. Introduction

The potential of new technology to support older people has emerged as a key area for service development in the health and social care sector (DoH, 2001; Royal Commission on Long Term Care, 1999; Sixsmith 2003). A key aspect of this is the use of IT to deliver, support and coordinate services and provide better information to all actors involved in social care (patients, carers, service providers etc.). There are a number of problems facing practical implementation within the health and social care arena (Kubitschke et al 2002). One key area is in the integration of the wide-ranging systems and devices that are becoming available. Most telecare applications have been developed as stand-alone devices and systems, or with only a limited degree of integration. All these would benefit from being linked within some kind of unifying framework. Diversity of services, wide distribution of services, the involvement of a broad range of stakeholders with different needs, expectations and skills, and the lack of central control contribute to the complexity of planning and delivery, all present particular challenges for IT development. There is need to:

- Provide a strategic approach for mapping out and modelling the functionality of telecare systems
- Define a way of modelling that will allow movement from the strategic level to the detailed level of functional specification

- Provide this in an industry standard format that will allow technology developers and IT people to collaborate using common notations
- Provide a way of facilitating dialogue between users, service experts and technology developers

Best practice in IT development has addressed many of the issues relating to the successful delivery of telecare, but not all, and the focus is mostly on the downstream aspects of design and construction.

In this paper we will briefly introduce a high level framework using the Unified Modelling Language (UML) and a protocol for the recording and organisation of stakeholder goals, processes to achieve those goals, and the embedding of IT functionality within processes to best achieve a broad satisfaction of stakeholder goals. This approach was initially developed by the authors as part of the PLANEC (1996-1999) research project (Vaarama 1996, Sixsmith 1996, 1997, Lunn 1997) that investigated the development of planning systems for care support for older people, and the approach has been more fully elaborated by Lunn (2003) as a more generic IT development approach, with roots in the Select Perspective (Allen 1998), the Dynamic System Development Method (DSDM), and the Userfit methodology (Poulson 1996). We see the key issue to be one of providing a systematic means of translating a strategic vision into concrete realisable telecare services.

2. The protocol and framework

Contemporary IT methods increasingly emphasise the need to take a more holistic and participatory approach to the development of requirements, focussing on a broad understanding of the environment and context for systems. We adopt an iterative approach based on cycling through the following stages:

- *Identification of stakeholders and stakeholder goals.* The process accepts conflict, and requires a comprehensive view of stakeholders, including funders, owners, managers as well as the more traditional users of a system.
- *Comprehensive overview of business processes.* This aims at collaborative production of a process map that covers the range of activities that exist or are needed to achieve the broadest possible goal satisfaction for the stakeholders.
- *Detailed elaboration of processes*, to clearly understand systemically and holistically the way services are provided. This is based on a workflow analysis utilising a structured scenario analysis, and recorded using UML activity diagrams.
- *Identification of telecare functionality.* This is achieved by reviewing the process steps and determining which process steps could utilise telecare. This may also be a creative process, that determines how processes could be revised to better achieve stakeholder goals.
- *Definition of telecare functionality.* This provides a detailed description of the actors within the care domain, and the telecare function points expressed as use cases, using UML use case diagrams.

- *Detailed elaboration of telecare functionality.* This utilises accepted practice in detailing a use case, using scenario analysis and activity diagrams akin to the detailed elaboration of processes above.

The first two stages are elaborated briefly below. For a fuller description of the generic approach, see Lunn (2003).

2.1 Stakeholder model

The first stage of the process is the construction of a stakeholder model. This needs to be as broad and comprehensive as possible. Our approach is derived from the Userfit methodology (Poulson 1996). We consider stakeholder as a broader term than is often used in requirements analysis; it is used to represent any individual or group with an interest in the business problem being studied. The hinterland of stakeholders that have a view on any particular telecare solution is substantial, and a recent workshop identified well over 20 categories, ranging from neighbours, through social services, to global players such as the European Union. One of the key challenges for telecare provision is understanding the impact of any proposal in terms of the different stakeholders, and an explicit listing of stakeholders is essential.

2.2 Stakeholder goals

Closely related to the concept of stakeholder is that of goal. In an ideal world stakeholders are people or groups of people working together to achieve some common purpose. However, a goal will depend on the perspective of the stakeholder owning the goal, and people or groups may have potentially conflicting goals because they have different worldviews. For example, a provider of health care, such as a hospital, has goals relating to maximum throughput and efficiency. However, someone needing treatment and their direct carers will wish for treatment at a time that is most convenient and least disruptive. There are also issues around clarity of goals, or goals that have become misdirected. An example here is where it is generally a goal to care for someone in their home as far as possible. This goal is driven by the perceived need of an individual for comfort and security, but in some circumstances treatment at home can be more threatening than treatment in an institution, with unfamiliar carers invading the caree's home.

2.3 Process map model of care

Our next stage uses a hierarchy of business processes as a framework that can be used in a variety of ways to construct requirements models and functional specifications for software systems. The method avoids complex notations, emphasises the use of terminology which is familiar to the broadest category of stakeholder, and can be driven by staff without substantial experience or training in computer systems development. Process mapping is a mile-high view of a business area, and is not set in concrete. It evolves and is refined over time. It does not have to be rigorously accurate

– it needs to be comprehensive rather than precise. One of its key roles is to act as a catalogue or table of contents of the business processes and ultimately the system use cases that sit within the business environment. From the process map, we choose processes to flesh out. Then from the processes we identify system use cases to define the system functionality and its interaction with the environment.

3. Conclusion

We have developed a comprehensive framework for the analysis of care systems and the embedding of telecare into a care process, in a manner that allows for traceability from stakeholder goals and constraints through to realised telecare functionality. The transfer of methods from the IT domain have had a positive impact on social research projects, whilst at the same time benefiting the IT methods. It utilises best practice from the IT industry and care provision research, with UML and methods derived from DSDM and USDP, and stakeholder methods adapted from Userfit. We recognise a number of challenges, notably in the application of IT modelling notations and methods with a broad range of stakeholders, but the approach we have developed is now mature enough to apply comprehensively.

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