Eliciting Stakeholders' Knowledge of Goals and Processes to Derive IT Support

Stewart Green

University of the West of England, Bristol, UK
stewart.green@uwe.ac.uk

Abstract. Development of many organisational computer-based systems should start with an understanding of business processes and goals. Much of this knowledge needs to be elicited from business experts. Although experts can articulate some of the knowledge (explicit knowledge) unfortunately they are not able to articulate all of the knowledge that they possess (implicit knowledge). In addition there is some relevant knowledge which they probably do not possess (new knowledge). This paper presents four techniques for eliciting knowledge, two of which—an adaptation of Contextual Design and self-observation and measurement—are particularly useful for eliciting implicit and new knowledge. A case study of a University Help desk is used to illustrate the four techniques.

1 Introduction

It is becoming increasingly accepted that the development of computer-based systems to support business processes should start with an understanding of business processes and business goals [1]. Unfortunately knowledge of those processes and goals is not always readily available. For example, written information is often non-existent or unreliable. So such knowledge needs to be elicited from business experts. However, although much of the knowledge that experts possess and use is explicit, some is implicit; a business expert may not be able to explicitly articulate all the goals and processes in the business environment.

In addition, it is still an open question as to what is the best way of using business goals and processes to derive appropriate computer-based systems for supporting the processes in order to attain the goals.

This paper addresses both issues. First it describes a goal-oriented approach for deriving both business process models and the requirements for computer-based systems that support them. And second it discusses a number of techniques for eliciting from business stakeholders explicit and implicit knowledge about both the business goals and processes that they are associated with.

2 Goals, Processes, and Computer-Based Systems

Figure 1 depicts a method for deriving requirements for state-of-the-art computer-based systems that support business processes and thus achieve business goals.

The method is based upon two principles. First, in order to improve some part of a business, that part must first be understood and conceptualised. Second, "a system which serves another cannot be defined and modelled until a definition and model of the system served are available" [2]. This has led to a two-stage method which first tries to gain an understanding of the current nature of a business area under investigation, and then uses that understanding to help to improve that area.

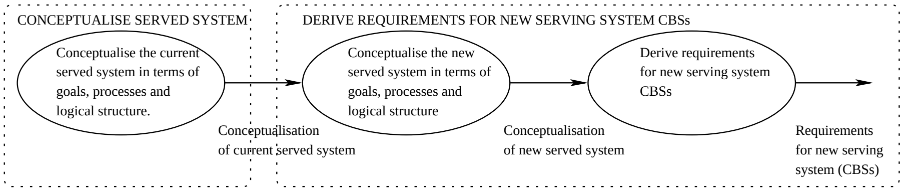
CONCEPTUALISE SERVED SYSTEM
DERIVE REQUIREMENTS FOR NEW SERVING SYSTEM CBSs
Conceptualise the current served system in terms of goals, processes and logical structure.
Conceptualise the new served system in terms of goals, processes and logical structure
Derive requirements for new serving system CBSs
Conceptualisation of current served system
Conceptualisation of new served system
Requirements for new serving system (CBSs)

Fig. 1. Overview of the method for deriving requirements

So in the first stage the current business area (served system) is conceptualised in terms of its goals, processes, and logical structure. In the second stage, the business area is first improved and reconceptualised, again in terms of goals, processes and structure. Then the requirements for state-of-the art computer-based systems (serving systems) are derived from the reconceptualisation.

In both stages, goals are characterised because they constitute the most fundamental feature of a business system; they define its purpose, its reason for existing. Processes are characterised because they are similarly fundamental in that they constitute the mechanisms by which the goals are achieved. The logical structure expresses the organisation of a served system in terms of its constituent subsystems, the roles associated with them, and the process activities contributed by the roles.

In stage two, stakeholders' goals for the new conceptualisation are established first. These are used to derive process models which facilitate the achievement of these goals. The derivation is informed by the knowledge of the state-of-the-art in IT tools for supporting processes. Finally, requirements for supporting IT tools are derived from the goals and processes.

The method outlined here is described in detail in [3].

3 Eliciting Stakeholders' Knowledge of Business Goals and Processes

The method described above uses a number of techniques to elicit implicit and explicit knowledge of the goals and processes characterising a business area from the business stakeholders. These techniques include the following: questionnaire, interview, self-observation and measurement, and external observation. The first two methods are particularly useful for eliciting explicit knowledge—what the stakeholder knows he or she knows. The fourth is useful for eliciting implicit knowledge—knowledge that the stakeholders are unaware that they have or use. The third is useful for eliciting knowledge that is probably neither explicitly nor implicitly known.

These techniques were all deployed in a large case study intended to demonstrate the utility of the method outlined above [3]. This case study involved applying the method to a University faculty's "Help Desk facility". It resulted in the design of both new processes for the Help Desk facility and of a new computer-based system to support the new processes. Examples from this case study are used below to illustrate points.

A generic questionnaire was completed by the client at the start of the method in order to establish his view of this business area's goals, problems, logical structure and other features. Questions included the following: "What do you consider to be the main high-level goals in your domain of responsibility?" and "What do you perceive to be the main problem areas within your domain of responsibility?"

Table 1 shows a part of the results about goals obtained from the client.

Table 1. Client's high-level goals

Goal Name	Goal Description	Goal Source	Goal Type	Goal Priority
USER SUPPORT: Support users	Provide a means for users to report problems and for these problems to be investigated and if possible corrected.	Faculty Computing Committee	Achieve; Maximise	1

The administration of this questionnaire and another one to the users of the help desk service—i.e. to faculty staff and students—readily provided a large amount of information on, for example, the main goals and problems associated with the help desk business area. Using the elicited goal and problem priority information and with the client's approval, the method was next able to focus more closely on a particular part of this business domain: viz on the management of user problems.

The client's staff were each interviewed over the course of approximately one hour in a quiet, private room. The interview questions were of two types: closed and open. The former required the interviewee to select one from a small number of answers, while the latter allowed the interviewee to choose their own answer and to digress into areas not covered explicitly but felt by the interviewee to be important. The questions were aimed at eliciting both broad knowledge of the goals (and other business features) held by the client's staff, and specific knowledge of goals and problems related to the management of user problems. In the latter category there were questions on the attitude of members of staff towards user problems; questions on how many problems they estimated that they solved and how many they passed on in unit time; and questions on how they managed long-term user problems. Interviewees were also invited to suggest process improvements to the user-problem mangement system.

The interviewees were enthusiastic in answering the prepared questions and particularly enthusiastic in putting forward their own ideas for improving the user-problem management system.

Using the knowledge elicited in these interviews, it was possible to model a number of important, current user problem mangement processes. One of these, the overall problem management process, is depicted below using RAD notation [4] in Fig. 2.

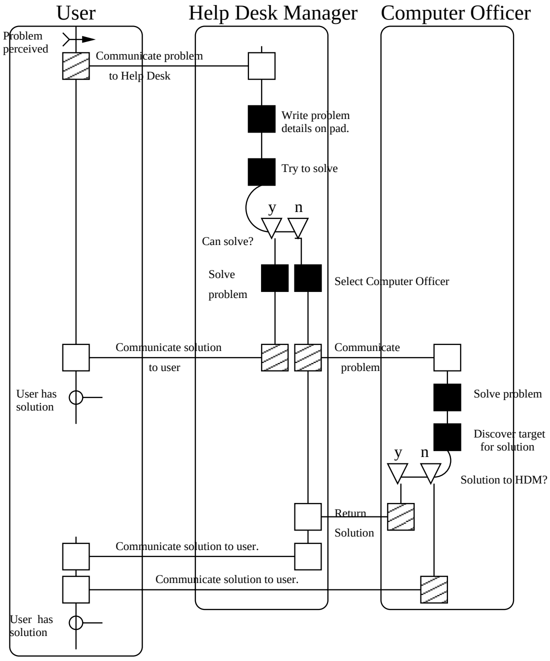

Fig. 2. The resolve user-problem process

Questionnaires and interview techniques have both been criticised for being able to elicit only explicit knowledge. But it is often claimed that people use substantial amounts of knowledge that they are unaware of to carry out tasks. In an attempt to overcome this problem, part of the established Contextual Design method [5] was adapted and administered to each of the three main types of help desk service provider: Help Desk, User Support, and System Support.

Representatives from each group were observed for a two-hour period as they carried out user-problem management work. During the period the representatives were also questioned about their work to clarify the observer's understanding of its nature. Part of the transcript for a session involving a representative for User Support is shown below:

```
1440 SM selects from e-mail list (of problems) the most urgent
     background problem to work on next.
1445 SM goes to the restore room in 2P46.
1450 SM suspects that the wrong tape is loaded.
1452 AB interrupts SM with a problem; he needs to restore a
     student's directory. AB leaves details with SM. AB indicates
     that it's not an urgent problem: it can be resolved whenever.
     SM puts down on his desk the piece of paper containing
     details of the problem.
```

By analysing the transcripts, it was possible to work out both the processes being followed by the members of staff, and what might be possible, feasible, and desirable process changes. The conclusions for new process activities and IT requirements which resulted from this work include the following. A computer-based problem management system (CBPMS) should support different kinds of problem solver in appropriate ways. In other words, the requirements for a CBPMS and typical patterns of interaction with a CBPMS are likely to be different for different kinds of user. For example, for Help Desk staff, the CBPMS should enable them to record and categorise each instance of user-problem quickly and easily; in particular, it should not compel them to enter descriptions of all user-problems.

The fourth technique that was used, self-observation and measurement, required each member of the Help Desk staff to record data about each instance of an encountered problem, each day for one week. The type of data recorded included the following: the category of problem; the type of user involved; the source of the problem; the medium of reporting; and whether or not the problem was solved on-the-spot and, if not, whether it was added to a long-term problem list or passed on. Table 2 summarises the results that were obtained for one day.

Table 2. Summary for one day of user problems presented and their destinations

Name of subsystem	**Problems presented**	**Solved on the spot**	**Number passed on**	**Number placed on long-term problem list**
Help Desk	125	115	10	0
Unix	40	25	5	10
Other systems	33	29	0	4
Totals	198	169	15	14

From this and the other days' tables more precise data was obtained about the flow of problems into and around the Help Desk service than had been obtained from interviews and questionnaires. For example, the table shows that most problems are solved on the spot with only fourteen long-term problems arriving during that day. Such figures were used to inform the design of a CBPMS.

4 Discussion

Goguen has discussed the difficulty of implicit or tacit knowledge [6]: managers "cannot accurately describe what their workers really do, what their clients really do or even what they really do". Despite this, in the case study referred to above it was found that both the client and the client's staff were able to articulate clearly the goals and activities associated with their work. This may have been due to their relatively high educational background, since most were educated to at least first-degree level. It may be the case that less able people would be unable to articulate goals at a level usable by the goal-oriented method outlined above. Further work is needed to answer this question.

Goguen goes on to say: "to build a system that effectively meets a real business need, it may be necessary to find out what workers, clients and managers really do" and "if we really need this information, it would be best to go where the work is actually done, and carefully observe what actually happens". In the case study referred to above, this was done using both a Contextual Design-like approach, and an observe-record approach. Both techniques yielded useful information about future feasible processes which it is unlikely that either the interview or the questionnaire technique would have yielded. The Contextual Design-like technique indicated, for example, that Help desk workers would not have sufficient time to key in details of user-problems. And the observe-record technique yielded precise data on the magnitude and directions of the flow of user-problems, which was probably unknown to the Help Desk staff.

The overall conclusion is that both types of knowledge elicitation techniques may yield useful knowledge for the development of both process models and the computer-based systems that support them.

References

1. Eriksson H-E., Penker, M.: Business Modelling with UML, John Wiley, (2000)
2. Winter, M. C., Brown, D. H., Checkland, P.B.: A Role for Soft Systems Methodology in Information Systems Development, European Journal of Information Systems, **4**, (1995), 130–142
3. Green, S.: A Goal-Oriented Approach to Requirements Engineering (Draft), PhD thesis, Faculty of CEMS, University of the West of England, (2002)
4. Ould, M.:Business Processes: Modelling and Analysis for Re-engineering and Improvement, John Wiley and Sons, (1995)
5. Holtzblatt, K., Beyer, H.: Contextual Design: Principles and Practice. In: Wixon, D., Ramey, J. (eds.): Field Methods Casebook for Software Design, John Wiley, (1996), 301–333
6. Goguen, J.: Requirements Engineering as the Reconciliation of Social and Technical Issues. In: Jirotka, M., Goguen, J. (eds.): Requirements Engineering: Social and Technical Issues, Academic Press, (1994)