Chapter 7

A Participatory Approach for Analyzing and Modeling Decision Processes: A Case Study on Cultivation Planning

Kathrin Kirchner
Friedrich Schiller University Jena, Germany

Ivonne Erfurth
Friedrich Schiller University Jena, Germany

Sarah Möckel
Friedrich Schiller University Jena, Germany

Tino Gläßer
Friedrich Schiller University Jena, Germany

André Schmidt
Friedrich Schiller University Jena, Germany

ABSTRACT

Most decision analytic research does not focus on initial steps of modeling and mostly concentrates on selecting preexisting algorithms. In this chapter we present how we can formalize decision intensive business processes based on a case study on a Decision Support System (DSS) for cultivation planning. Decisions in this problem area depend notably on expertise and experience acquired by the farmer. As a first step the decision process of the agriculturist needs to be explored, analyzed and documented. Afterwards all information and data, which leads up to a decision, will be collected, systemized and grouped. We will apply user participative techniques that integrate the farmer as a cooperative partner into the modeling process. The outcome of this modeling leads to a formalized model later on. On account of this approach the DSS will represent the real decision process of the farmer and increases trust in the decisions suggested by the system.

DOI: 10.4018/978-1-61520-881-4.ch007
INTRODUCTION

In long-term cultivation planning a number of factors, such as soil conditions, water supply, selection of fertilizers, or the current market situation influence the crop choices and production. Due to the high number of parameters involved, it is difficult for farmers to make an adequate decision without the help of a software solution. Expert knowledge and expertise from farmers can be collected and analyzed in an intelligent DSS to assist the farmer in making optimal decisions in cultivation planning.

Methods for collecting knowledge and data together with the farmer and for formalizing this data and knowledge intensive business process are essential to build a suitable DSS. Most decision analytic research does not focus on initial steps of modeling, but rather concentrates on evaluation and choice. Today, no commonly used tool for domain analysis and modeling of DSS exists (Liu & Stewart, 2004).

Cultivation planning is an example where the acquisition of expert knowledge and experience is the crucial factor concerning the success and quality of a DSS. The better we understand the problem domain the better our solution will be. We propose to apply user participative approaches like card games to model the decision process together with the farmer and later transform these user understandable cards into a more formal representation as a basis for the software developer. These formal models can then be used to find an appropriate algorithm that supports the decision making process.

Participatory Analysis and Design (PD) promises to be very fruitful to master the above mentioned challenges. It builds on democratic participation of stakeholders in the software development process (Muller & Kuhn, 1993) and mutual learning among software engineers, future end users and other stakeholders (Bodker et al., 2000). Beside the exploration of expert knowledge, letting farmers and other stakeholders participate in the DSS development process will further lead to gradually establishing trust into the DSS and to increasing the overall acceptance of the system.

Among different practices of PD we consider a card game named CUTA (Lafrenière, 1996), Collaborative Users’ Task Analysis, to be highly useful for analyzing and modeling DSS. With CUTA we can discuss, analyze and document processes or workflows on the farmers’ or non-technical expert’s level. CUTA modeled originally sequential processes using a set of cards with color-coded activities. For the development of DSS we extend CUTA with a new Decision Card and further card elements e.g. additional text fields for important information. Furthermore we introduce new card types to collect decision criteria and decision alternatives.

Decision scientists are well aware of the close connection between human action and decision making procedures. Choosing CUTA as a communication and documentation facility will eventually reveal current decision making processes as well as decision criteria and alternatives.

BACKGROUND

For long-term decision cultivation planning an introduction of a DSS can be helpful. The development of such a DSS needs expertise from three different research areas. The DSS is domain-driven, in our case, based on the agricultural application. Thus, information about the cultivation planning and expert knowledge of farmers will be incorporated into the DSS Analysis. Similarly knowledge from decision science (with roots in management and psychology) and requirements engineering flow directly into the DSS Analysis. Hence, we will investigate in more detail various decision and process models we can use or adapt for analyzing and modeling such a DSS (Fig. 1). In the following, we will introduce background knowledge of these three areas.