8 Measurement and Decision Making

Michael Berry and Aybükê Aurum

Abstract: Value-Based Software Engineering requires the capability to measure and analyze value in order to make informed decisions. The difficulty experienced by many organizations in measuring concepts that are even simpler than value suggests that this requirement will be hard to meet. The goal of this chapter is to build an understanding of measurement and decision making and the relationship between them. A multi-view model of measurement is presented as a way to cope with the complexity of measuring concepts such as value. A behavioral decision making model is presented that identifies the points at which measurement products impact the decision making behavior of a manager or software engineer. This model attempts to satisfactorily account for the idiosyncrasies of human behavior, while preserving some elements of the rational model of decision making. The chapter concludes with an application of these models to a case study in which achieving value is a key goal.

Keywords: Decision making, decision support system, image theory, measurement and analysis.

8.1 Introduction

This chapter is intended to be of interest to people involved in software engineering, from programmer to project manager, needing an introduction to measurement and decision making. As the reader progresses through the chapters of this book, we suggest that he examines the nature of the decisions made in a VBSE framework and thinks about the role of measurement in those decisions. Whether the chapter is describing VBSE best practice or detailing useful techniques, consider the measures that will need to be collected and analyzed in order to carry out the practice or be used in the technique. From our perspective, if you can not measure value, you can not manage it.

Value-Based Software Engineering (VBSE) is a framework for improving the systems delivered to the clients by incorporating value considerations into the technical and managerial decisions that are made during system development and maintenance. The term, “incorporating value considerations,” is managerial jargon for measuring (or estimating) value-related attributes and producing information from those measures that can aid decision makers. Adopting VBSE will present challenges for both software engineers and software measurement specialists. It is simpler to measure and make decisions in a client-value neutral setting, especially when technical and project issues fully consume management attention. It is simpler to assume that the specifications of functional and nonfunctional system requirements constitute all the client’s expectations. Unfortunately this simplicity is
gained at the client’s expense in that the delivered systems cannot provide the best possible outcome to the stakeholders. Of course, the best system developers are never client-value neutral; but such developers are in short supply and we must turn to frameworks that enable ordinary people to achieve equivalent outcomes. VBSE provides such a framework by informing software engineering decisions with considerations of value.

In this chapter, we will focus on decision making and measurement within a VBSE framework. Because informed decision making is based on information, we will discuss the relationship between decision making and software measurement and analysis. We will use two models for the discussion that cope well with the intangible, multi-attributed nature of value. The decision making model provides a non-deterministic, behavioral model for the way managers make decisions with the help of indicators of value, quality, satisfaction, motivation, productivity, and effectiveness. The common element in these models is the metaphor of mental images as ill-defined, ephemeral, and highly personal constructs. The goal of measurement and analysis is to create these images in the mind of the decision maker; the goal of the decision maker is to process these images in order to arrive at an optimal course of action. These models are not specifically concerned with the measurement of value and decision making based on value. However, throughout this chapter, issues relating to value will be addressed.

In the next Section (8.2) these models are discussed in detail. Because software engineering typically occurs in an organizational context and the discussion to this point has been concerned with individual decision makers, the following Section (8.3) discusses the applicability of the model to group decision making. Section 8.4 presents a descriptive model of the process by which a person is stimulated to make a decision as a result of receiving a set of indicators derived through measurement and analysis. Section 8.5 explores the relationship between measurement and decision making. The concepts are brought together in Section 8.6 by a practical example of a decision making support system with associated measurement and analysis.

8.2 Models of Measurement and Decision Making

Software engineers often build systems that address the information needs of people in other business units but they pay less attention to their own information needs. A framework for software measurement and analysis has the characteristics of an information system, the goal of which is to deliver information products that satisfy the information needs of a software engineer. Information needs arise from the managerial and engineering tasks that people routinely carry out in order to deliver and maintain software-based systems. Decision making within a VBSE framework requires the inclusion of indicators of value in the information products on which software decisions are made. In the jargon of measurement specialists, Value is a measurable concept, that is: something that is not tangible but can still be measured using an appropriate scale. Some measurable concepts are sim-