Chapter 9
End-User Software Engineering and Why It Matters

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ABSTRACT
End-user programming has become ubiquitous; so much so that there are more end-user programmers today than there are professional programmers. End-user programming empowers—but to do what? Make bad decisions based on bad programs? Enter software engineering’s focus on quality. Considering software quality is necessary, because there is ample evidence that the programs end users create are filled with expensive errors. In this paper, we consider what happens when we add considerations of software quality to end-user programming environments, going beyond the “create a program” aspect of end-user programming. We describe a philosophy of software engineering for end users, and then survey several projects in this area. A basic premise is that end-user software engineering can only succeed to the extent that it respects that the user probably has little expertise or even interest in software engineering.

INTRODUCTION
It all started with end-user programming.

End-user programming enables end users to create their own programs. Researchers and developers have been working on empowering end users to do this for a number of years, and as a result, today end users create numerous programs.

The “programming environments” used by end users include spreadsheet systems, Web authoring tools, and graphical languages for creating educational simulations (e.g., Burnett, Chekka, & Pandey, 2001; Lieberman, 2001; Little, Lau, Cypher, Lin, Haber, & Kandogan, 2007; Pane, Myers, & Miller, 2002; Repenning & Ioannidou,
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Figure 1. U.S. users in 2006 and those who do forms of programming. (This is a summary of data in Scaffidi, Shaw, & Myers, 2005)

2006). Using these systems, end users create programs in forms such as spreadsheets, dynamic Web applications, and educational simulations. Some ways in which end users create these programs include writing and editing formulas, dragging and dropping objects onto a logical workspace, connecting objects in a diagram, or demonstrating intended logic to the system.

In fact, research based on U.S. Bureau of Census and Bureau of Labor data shows that there are about 3 million professional programmers in the United States—but more than 12 million more people who say they do programming at work, and more than 50 million who use spreadsheets and databases (Scaffidi, Shaw, & Myers, 2005). Figure 1 shows the breakouts. Thus, the number of end-user programmers in the United States falls somewhere between 12 million and 50 million people—several times the number of professional programmers.

Clearly then, end-user programming empowers—it has already empowered millions of end users to create their own software.

Unfortunately, there is a down side: the software they are creating with this new power is riddled with errors. In fact, evidence abounds of the pervasiveness of errors in software end users create (e.g., EUSPRIG, 2009). These errors can have significant impact. For example, one school faced a £30,000 shortfall because values in a budget spreadsheet had not been added up correctly (EUSPRIG, 2009, no. 67). TransAlta
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