End User Computing:
The Dark Matter (and Dark Energy) of Corporate IT

Raymond R. Panko, Shidler College of Business Administration, University of Hawaii, Honolulu, HI, USA

Daniel N. Port, Department of Information Technology Management, University of Hawaii, Honolulu, HI, USA

ABSTRACT

End user computing (EUC) is like dark matter in physics. EUC is enormous in quantity and importance yet has been largely invisible to corporate IT departments, information systems (IS) researchers, and corporate management. EUC applications, especially spreadsheet applications, are also "dark" in the sense that they pose a number of overlooked risks for organizations, including errors, privacy violations, trade secret extrusions, and compliance violations. On the positive side, EUC applications are also like the dark energy of physics. They are supporting critical gains in decision making, computing by scientists and engineers, operational systems, and other important processes in every corner of the firm. It is time to stop ignoring end user computing in general and spreadsheets in particular. The purpose of this paper is to document to the extent possible today then importance of end user computing relative to the concerns of corporate IT departments and IS researchers.

Keywords: End User Computing, Spreadsheet, Spreadsheet Error, Human Error, Base Error Rate, Cell Error Rate, Mission-Critical, Descriptive Research, Primary Descriptive Research, Use And User Studies, User Studies, Third Generation Languages (3GLs), Fourth Generation Languages (4GLs)

Professionals Built the Titanic.
Amateurs Built the Ark.

INTRODUCTION

In the 1930s, astrophysicists discovered that ordinary matter is only about a fifth of the total matter of the universe (NASA, 2010). The rest consists of *dark matter*, which is not simply too dim to see but actually is radically different from ordinary matter. In the last years of the 20th Century, astrophysicists received another shock. Something else, which physicists labeled *dark energy*, is pushing the universe to expand at an ever-increasing rate. This dark energy is almost three times as large as ordinary matter and dark matter combined (NASA, 2010). Traditional physics, instead of describing the universe, had only considered about five percent of it.

The contention of this paper is that end user computing (EUC) in general and spreadsheets in particular are the dark matter and dark energy of corporate information technology. EUC is like dark matter in the sense that it is enormous in size and impact yet seems to be invisible to the central corporate IT group, to general corporate management, and to information systems (IS) researchers.

EUC is also "dark" in another sense. We will see that research has shown that developers in departments outside the central IT departments develop many incorrect applications (Panko, 2012b). However, the problem does not appear to be end user computing tools *per se*. We will see that error rates in EUC spreadsheet development are no higher than error rates when professional programmers write applications in third generation languages (3GLs). Rather, the root problem appears to be poor end user development practices, especially an almost total lack of professional-grade testing. We need to teach new dogs old tricks learned painfully by programmers in the early years of software development.

However, nothing can be done about EUC risks until IS researchers decide to study them, corporate management assumes responsibility for identifying and reducing these risks, and corporate IT departments stop saying, "End user computing? That's a business thing," and, "Yes, we have a help desk. What's your point?"

More excitingly, EUC also appears to be the *dark energy* of corporate IT. Applications developed by end users seem to be powering nearly every knowledge worker and department in corporations today. These applications go far beyond downloading and massaging data from central corporate databases. We will see that end user-developed-applications are enormous and complex. In addition, a large fraction of all knowledge workers and departments seem to have one or more EUC application that they characterize as mission-critical. Instead of focusing so heavily on traditional central corporate information systems and spin-offs, IS researchers need to understand how EUC is energizing the corporation's myriad departments and employees

REVISING BELIEFS ABOUT SPREADSHEET APPLICATIONS

In this paper, we focus heavily on spreadsheet applications because they are arguably the most studied aspect of end user computing. Spreadsheets are usually viewed as personal productivity applications used to download corporate data, quantify decision analyses, and do relatively straightforward computation tasks. In fact, spreadsheets are used in a broad spectrum of corporate activities. This difference between stereotypes and realities illustrates the dark matter nature of spreadsheets and of end user computing as a whole.

Application Development Tools

Often, practitioners and researchers make a distinction between *programmed* applications developed with 3GLs on the one hand and EUC applications built with spreadsheets and other 4GLs on the other hand. We argue that this distinction is counterproductive.

In his early years, the first author wrote 2GL programs using assembly language. When programmers switched to 3GLs like COBOL or FORTRAN, they did not stop calling what they did *programming*. Certainly, many old diehards argued that 3GLs were toys that did not let you reach into individual registers. They also argued that 3GLs were too domain-specific. However, 3GL productivity gains were enormous, and rapidly increasing processing speeds made 3GL processing penalties unimportant. Most importantly, individual 3GLs proved to be broad-spectrum languages that could create a wide variety of applications. There were few application development needs that could not be met with 3GLs.

Beginning in the 1970s, another generation of development tools emerged. People inside and outside of the central IT department began to develop applications with 4GL tools, including spreadsheet programs, database applications, and other 4GL integrated development environments. Again, many 3GL proponents argued that this was not "programming." But was that relevant? The goal is to develop effective ap-

Related Content

An Investigation of Patient Decisions to Use eHealth: A View of Multichannel Services
Suli Zheng, Po-Ya Chang, Jiahe Chen, Yu-Wei Changand Hueng-Chuen Fan (2022). *Journal of Organizational and End User Computing (pp. 1-24).*
www.irma-international.org/article/an-investigation-of-patient-decisions-to-use-ehealth/289433

Differential Effects of Renqing and System on Employee Work Quality
Bijun Xie, Sue Lin Ngan, Min Liand Fangbin Xiao (2023). *Journal of Organizational and End User Computing (pp. 1-18).*
www.irma-international.org/article/differential-effects-of-renqing-and-system-on-employee-work-quality/325507

Intelligent Information Personalization: From Issues to Strategies
Syed Sibte Raza Abidi (2009). *Intelligent User Interfaces: Adaptation and Personalization Systems and Technologies (pp. 118-146).*
www.irma-international.org/chapter/intelligent-information-personalization/24473

Users as Developers: A Field Study of Call Centre Knowledge Work
Beryl Burnsand Ben Light (2007). *Journal of Organizational and End User Computing (pp. 42-56).*
www.irma-international.org/article/users-developers-field-study-call/3832

The Influence of E-Book Teaching on the Motivation and Effectiveness of Learning Law by Using Data Mining Analysis
Shouzheng Zhaoand Jielei Chen (2022). *Journal of Organizational and End User Computing (pp. 1-17).*
www.irma-international.org/article/the-influence-of-e-book-teaching-on-the-motivation-and-effectiveness-of-learning-law-by-using-data-mining-analysis/295092