

GUEST EDITORIAL PREFACE

Users and Uses Research: Understanding “The Familiar Unknown”

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INTRODUCTION

Many papers relevant to end user computing were presented at the 45th Hawaii International Conference on System Sciences in 2012. This special issue presents five of them. These papers explore a range of topics and methodologies. This introduction to the special issue presents a research method/maturity stage matrix for classifying end user computing research. It discusses the five papers in terms of their content and in terms of their position on the matrix.

This paper is an introduction to the *Journal of Organizational and End User Computing's* special issue on end user computing research at HICSS 45—the 2012 Hawaii International Conference on System Sciences. HICSS is one of the oldest and largest information systems conferences. Quite a few of the 700 papers presented at the conference dealt with end user computing. The special issue presents five of these papers. They span a range of topics and research methods important to the understanding of end users.

In marketing, students are warned that the customer is “the familiar unknown.” Companies deal with their customers every day and believe that they understand them. When they do marketing research, however, they are always surprised by what they find. The best companies do extensive market and marketing research to develop a detailed understanding of their customers based on data instead of stereotypes, impressions, and assumptions.

In contrast, most corporations and information systems researchers still use the vague term “end user” to describe the perhaps 90% of the people in organizations who use IT. These include line managers, staff managers, professionals, operating personnel, and many other types of workers. These employees are vastly different from one another, and even within occupational groups, they use information technology in profoundly different ways. Giving a simplistic name to this heterogeneous world is a testament to our continuing ignorance about IT users outside the IT department. It is not something to be proud of. We need to greatly expand the scope of users and uses research.

The Methodology/Phase Research Matrix

Figure 1 illustrates a framework for classifying end user research. Darkened areas are exemplified in the papers in this special issue.

Maturity-of-Knowledge Dimension

The figure has two dimensions. The horizontal dimension is maturity-of-knowledge stage. This dimension asks how mature our understanding of a research issue is. Note that theory testing is *not* the final stage in this dimension.

- *Exploratory stage* research is useful when we do not understand the basic research issue well. For example, in spreadsheet research, early exploratory research focused on the types of errors that developers made and how frequently they made errors of each type. Exploratory research is a foundation for later research. Doing later-stage research is like being separated from the world by a wall, and research projects drill small holes in the wall to permit researcher to peek through. If the researcher does not have good a priori knowledge about what is on the other side of the wall, he or she may drill holes in uninteresting areas or, worse yet, believe that what he or she sees through a hole in the wall is representative of the whole. In many fields, exploratory

research is only done at the beginning of research in an area. However, in areas like end user computing, in which the situation is changing constantly and radically, exploratory research needs to be done continuously. In this special issue, Panko and Port discuss the importance of “primary descriptive research.”

- *Theory development and testing* are discussed widely in the research literature. Although they are very important, and although several papers in the special issue concern these stages, there is no need to cover them in this introduction.
- *Assimilation research* is the final and highest maturity stage. It embraces the many types of research that helps organization understand how to assimilate research findings. It is said that there is nothing as relevant as a good theory. However, there is probably nothing as irrelevant as a theory that is not used. Theory testing is typically depicted as the highest form or research. “Technology transfer,” in contrast, is typically viewed as being something like low manual labor. In applied fields such as information systems in general and end user computing in specific, this is disrespectful to our corporate reference field. Organizations do not merely adopt research findings; they assimilate them by adapting them to organizational processes in a complex way.

Figure 1. Research methods and phase matrix

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
Observation				
Interview				
Focus Group				
Case Study				
Quasi Experiment				
Experiment				
Questionnaire				
Cognitive Science				
Survey Research				

In addition, in medicine there is a need to prove medications to be reasonably safe and effective before releasing them. Many prescriptions based on theory that is tested and published in top journals may turn out to be ineffective or even unsafe in the real world. The Panko and Port paper in this issue marshals evidence that companies need to determine whether they should manage end user computing more proactively.

Research Methodologies Dimension

The second dimension in Figure 1 is research method. Roughly, as you read from top to bottom, you encounter methods that take you farther from the richness of end users. Most of the research categories are familiar, but we will note some points about a few.

- *Data mining* is the analysis of data about end users. This may involve statistics on how often and how long people use specific mobile apps in a company. It may also involve national data on employment, as discussed in Panko and Port in this issue. Analyzing government data is likely to be straightforward. In contrast, even getting access to corporate data is challenging, but the volume of data is often massively detailed.
- *Observation, interviews (in depth), and focus groups* follow data mining. In general, the first four categories are close to the richness of the end user experience. They are also infrequent in the literature. They tend to be used at the exploratory stage, and they tend to have lower rigor—although they may lead to more new insights than methods lower in the list. The relative absence of studies using methodologies near the top of the table may reflect a strong journal bias against such research.
- *Case studies* come in two forms. Traditional *deep case studies* are based on a detailed analysis of a situation conducted by the authors and relying on access to people and business records. In contrast, incident reports give specific information of interest on a particular topic in an actual situation. Incident reports are best when drawn from a thorough published analysis of a situation conducted by a reputable source. They then focus on lessons learned for a particular research question. Thorne does this for the problem of spreadsheet fraud, which has been studied much less than spreadsheet error. He draws upon a detailed audit of the situation conducted for regulators. Thorne also integrates other incident report of varying depth.
- *Questionnaires* are often thought of as being “close to the user,” but questionnaires typically only cover a narrow set of topics, so they do not give a rich picture of the user. They compensate for this by showing what a large number of people think. Unfortunately, many questionnaires in the information systems field fail to observe good practices learned in other fields that use questionnaires extensively. In such cases, a questionnaire is a method but not a methodology.
- *Cognitive science* is a relatively new field, but it is already helping to shed light on how people think and use computers. One intriguing study found that when people were doing routine tasks, their brains occasionally switched to a “resting condition” without the subject’s knowledge. During the next 30 seconds, there was a substantially heightened probability of making an error (Eichele et al., 2008). Many human-computer interaction research questions might benefit from cognitive science. In general, cognitive science is most useful today for the two extremes of exploratory research and assimilation research phases. In the latter case, cognitive science helps explain some reasons for people failing to use tools well in practice. The Jenkins, Durcikova, and Burns paper in this issue exemplifies the latter by showing that richer presentations are not necessarily more effective.
- Finally, *survey research* integrates findings from several studies and often from

multiple methodologies. The Panko and Port paper in this issue is an example of this. It focuses on integrating findings, most commonly from exploratory studies. Its purpose is to provide a coherent justification for taking spreadsheets (and end user computing in general) seriously as an information systems research topic. This information should also be helpful in assimilation by alerting corporations to the need to begin managing spreadsheets more proactively.

PAPERS IN THE SPECIAL ISSUE

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

Raymond R. Panko, University of Hawaii, USA
Daniel N. Port, University of Hawaii, USA

This paper attempts to demonstrate that end user computing is far too important to continue to be ignored by corporations, IT professionals, and IS researchers (Figure 2). The paper brings together many pieces of evidence that

demonstrate end user computing's ubiquity, importance, and risks. End user computing is not simply a set of personal productivity tools for individuals. It has expanded since its early years to play a critical role in many corporate processes, including operational systems like financial reporting, that are governed by compliance laws.

The paper uses the metaphor that EUC is like the dark matter and dark energy of physics. It is like dark matter in that it is enormously larger than traditional IT yet it is widely ignored. It is also "dark" in the sense that it creates risks to which few organizations are attending. However, it is also the dark energy of corporate IT, bringing performance gains to a nearly every corner of the corporation.

The paper ends by arguing that we need to do far more research on end user computing. In particular, our understanding of users and their uses of IT is so superficial that we need to begin doing a great deal of primary descriptive research to understand the diversity of users and uses and to gain insights into how they use IT to drive corporate performance. This will require in-depth analysis of government data and corporate data, as well as wide-focus interviews with large numbers of corporate IT users.

Figure 2. The Panko and Port study

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
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The Misuse of Spreadsheets in the Nuclear Fuel Industry: The Falsification of Safety Critical Data Using Spreadsheets at British Nuclear Fuels Limited (BNFL)

Simon Thorne, Cardiff Metropolitan University, Wales, UK

This paper reflects on a particularly dark chapter in nuclear safety (Figure 3). At least two shifts of workers faked data on quality inspections of Mixed Oxide (MOX) fuel pellets produced at the Sellafield operation of British Nuclear Fuels Limited (BNFL). They did this by copying the results that previous shifts had entered in spreadsheets into the spreadsheets on which they were supposed to record their own work. Their reasons for faking the data are unknown, but the personal benefits they must have received from doing so must have been minor. In contrast, the impact of their misconduct was enormous. BNFL had to pay millions of pounds to ship pellets of unknown quality back from Japan and Germany, and Japan stopped doing business with BNFL. The losses to BNFL were heavy.

The paper draws upon a detailed audit of the incident. The purpose of the paper is to interpret what EUC researchers and corporations can learn from the incident to think about how spreadsheets (and other aspects of end user

computing) need to be managed. The paper describes how the misbehavior was discovered and discusses why spreadsheets, which were a convenient way to record results, were so difficult to control. It also discusses the specific management lapses that may have made such spreadsheet falsifications almost inevitable. The paper argues that spreadsheets should have been replaced by a custom-built (bespoke) system.

A Composite Framework for Behavioral Compliance with Information Security Policies

Salvatore Aurigemma, University of Hawaii, USA

One of the great puzzles in security is why so many “good” employees cause harm by failing to follow the firm’s information security policy (ISP). These good employees often cause far more total damage than attackers driven by nefarious motivations.

Aurigemma examined a number of critical papers that looked at factors that impel employees to comply with ISP requirements (Figure 4). These papers have used influence diagrams to model interactions among variables. They collected data from many users and asked about these factors and also about the users’ expressed intention to comply with security

Figure 3. The Thorne paper

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
Observation				
Interview				
Focus Group				
Case Study				
Quasi Experiment				
Experiment				
Questionnaire				
Cognitive Science				
Survey Research				

Figure 4. *The Aurigemma paper*

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
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Interview				
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Case Study				
Quasi Experiment				
Experiment				
Questionnaire				
Cognitive Science				
Survey Research				

policies. Unfortunately, the analysis, which is presented in the paper, found a number of issues in these studies. For example, they often used very similar operationalizations of several variables but used different terminology. (In one case, two papers drawn from the same database did this). This makes the studies difficult to compare. All models were validated through the data that they collected, but it is difficult to draw conclusions given the diversity of conceptual models. In addition, few studies determined whether the behaviors they asked about were part of the firm's ISP or even whether the firm had an ISP. In addition, the studies either asked about a general intent to comply with the firm's ISP or intent to comply with specific aspects of the ISP but not both. Finally, the papers tended to use analysis methods that are popular but that should not be applied in studies like these.

The paper then describes an ongoing study on ISP compliance intentions. It presents an integrative model of concepts and their relationships that and discusses an analysis method that will be more appropriate in terms of quantitative analysis. The model is currently being applied to a sample of people who have a particular ISP, who are tested on their knowledge of this ISP annually, and who are required to comply with a number of specific provisions.

The study explores compliance intent overall and for specific situations. In an important extension, it looks at intention to report others for security violations under varying conditions of differing organizational status.

Simplicity is Bliss: Controlling Extraneous Cognitive Load in Online Security Training to Promote Secure Behavior

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Alexandra Durcikova, University of Oklahoma, USA
Mary B. Burns, Montana State University, USA*

It is important to train users how to create strong passwords and to take other actions to keep them and the resources they use safe. The question is how to do so. This paper focuses on training users to create strong passwords (Figure 5). In an experiment, subjects were divided into three groups. One had no training in how to create strong passwords. Another had a minimalist presentation in which the rules for creating a strong password were shown on a single slide. The third had a multimedia presentation that provided more detail on each password specification rule. The researchers described the rich presentation as having extraneous information

Figure 5. The Jenkins, Durcikova, and Burns paper

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
Observation				
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that would interfere with learning the rules for creating strong passwords. Their reasoning had strong theoretical support, and it worked. With no training, subjects had a password strength score of approximately 3.1 on a 4 point scale. For minimalist training, the score rose to about 3.6, while for the rich presentation with considerable extraneous content, performance fell to about 3.2. The minimalist score was significantly

higher than scores in the other two conditions, with a p value less than 0.001.

Involving End Users to Mitigate Risk in IS Development Projects

Chintan Amrit, University of Twente, The Netherlands

Figure 6. The Amrit, van Hilegersbert, and van Diest paper

Research Category	Exploratory	Theory Building	Theory Testing	Assimilation Research
Data Mining				
Observation				
Interview				
Focus Group				
Case Study				
Quasi Experiment				
Experiment				
Questionnaire				
Cognitive Science				
Survey Research				

*Jos van Hilegersbert, University of Twente,
The Netherlands*
Bart van Diest, Linder N.V, The Netherlands

In the most traditional study in this special issue, the researchers focused on how effective user participation was in addressing various project risks (Figure 6). The research team surveyed engagement managers at Capgemini, a consulting company in the Netherlands. Of the 50 engagement managers at Levels 1, 2, and 3, twenty eight responded. From in-depth interviews, a taxonomy of participation modes was created. In addition, each manager was asked to select two engagements—one successful and the other unsuccessful. The participants rated the degree

to which they were able to mitigate 5 key risks with user participation. The risks were technical complexity, organizational complexity, project size, overambitious demands, and unstable/incomplete requirements.

REFERENCE

Eichele, T., Debener, S., Calhoun, V. D., Specht, K., Engel, A. K., & Hugdahl, K. ... Ullsperger, M. (2008, April 21). Prediction of human errors by maladaptive changes in event-related brain networks. *Proceedings of the National Academy of Science*, 105(16), 6173-6178.

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