

EDITOR'S COMMENTS

Use¹

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...man's reach should exceed his grasp, or what's a heaven for?
 – Robert Browning

Use of information systems² is, arguably, the most critical variable in the entire repertoire of empirical and behavioral studies pinpointed at the intersection of computing and human beings (Burton-Jones and Straub 2006; Petter et al. 2008). It serves as the ultimate goal for numerous key antecedents such as systems design artifacts (e.g., usability, systems/information/service quality, recommender systems, personalization, and auction affordances), cost factors, affective factors (as discussed in Pallud and Elie-Dit-Cosaque 2008), beliefs (e.g., perceived usefulness, perceived ease-of-use), security attitudes (Warkentin et al. 2012), entrepreneurial determinants (del Giudice and Straub 2011), and generic attitudes/intentions.³ Interestingly, it can itself serve as an important antecedent to outcomes including performance and net benefits (DeLone and McLean 2003). These effects occur at varying levels of analysis (e.g., individual level, workgroup level, business unit level, firm level, network level, and industry level, as discussed in Burton-Jones and Gallivan (2007).

In short, use is critically important. It is not only important for scholars. It is equally if not more so for practice. If meaningful use is not a realized outcome for new systems, then these systems can become toxic and create huge drags on performance rather than the inverse (for snippets of this thinking, see Kohli and Grover 2008).

It is perhaps implicit in the DeLone and McLean systems success model and in other models where systems use plays a key role that system use is intended to be *meaningful use* or *adapted use*. Some scholars have tried to reformulate use in this way (Chin et al. 1997; DeSanctis and Poole 1994) and this has been a fruitful (but sadly stillborn) development. The bulk of our research

¹This commentary marks the final editorial of Detmar Straub (EIC, 2008-2012), but in keeping with his past practices in this venue, it will mostly attempt to address substantive issues rather than ruminations on issues that are personal or opinions about the IS discipline. Since it might be useful to have a record of such parting thoughts as EICs conclude their tenure in the role, there will be such a short section of the editorial, but the first part of the editorial will be a dual authored treatise on system use.

²Use goes by different names and nomenclatures. It also appears as *systems use*, *systems utilization*, and *systems usage*. Another surrogate is *intention to use*, and variants.

³Virtually any TAM article could be cited here as could articles in diverse topic areas such as the use of systems in the Arab world (Loch et al. 2003).

efforts continue to treat use as a throwaway variable, measuring it in a lean manner even when a richer set of measures is clearly called for by their own research models (Burton-Jones and Straub, 2006).⁴

The bottom line is that while use is everywhere recognized as a focal variable for the IS field, it is hardly ever taken seriously. Researchers continue to pull both their conceptualizations and measures from other works, works that are hardly to be held up themselves as exemplary. One of the standard ways of justifying this practice is to say, quite disarming, that the researcher in question has adopted (or adapted) the use measures from “previously validated instruments.”

What is typically meant by such phrases is that previous studies may have engaged in statistical exercises to demonstrate a minimal level of reliability and construct validity (convergent and discriminant validity). Common methods variance may also have been tested and occasionally nomological validity. What is nearly always missing, though, is truly sufficient content validity (Boudreau et al. 2011; Straub et al. 2004),⁵ or even worse, a careful mapping of the use construct to upstream and/or downstream variables in the researchers' model (Burton-Jones and Straub 2006). In short, measurement is rarely contextualized and, as a result, explained variances are weak, modest, and less than convincing.

Quo Vadis, Use?

How can this be improved? How can we begin to formulate research programs where use is not a throwaway variable, but one that creates powerful insights into the connection between people and computers? A foray into this kind of thinking was begun in an article that Andrew Burton-Jones and Detmar Straub published in *Information Systems Research* in 2006. The stance in the present editorial is that we, as a field, need to delve much more often into this sort of conceptualization of use.

Individual Use: A Brainstorm (even a brainy shower or a brainy drizzle)

We argue that significant use is a torrent. When it comes, it comes as a rush. The interaction between the user and the system becomes a frenzy of excited activity that is the outcome of the human and the machine working seamlessly together to achieve wonders of thought and perspective.

Thus, for scholars, use is most interesting when it is conceptualized in our causal models at the “deep structure” level (Burton-Jones and Straub 2006). No doubt, there are plebian uses of systems that characterize, say, 80 to 85 percent of the overall activity on computer systems. These are assuredly vital transactional uses of systems. But they are not much more than super-efficient ways to process or create information, which we have been doing ever since human beings started to talk. This line of reasoning follows the distinction made in the strategic management literature between transactional and transformational leadership (Eagly et al. 2003; Kotlyar and Karakowsky 2006).

Transformational (or transformative) uses of systems are different (and also rarer). When our minds meld with the system (think of a cyborg that is benevolent rather than malevolent), we utilize the capabilities of the computer to create something that has not been seen before. A novel idea. An invention. A new perspective.⁶

This epiphany leads the user into modes and ways of thinking that could not have occurred without the affordances of the system. It could be creating a new formula in Excel, one that crystalizes a user's thinking about the mathematical relationships among information nodes. Deep structure usage can occur in the way a person restructures information, re-sorts columns, moves information blocks around within a set of writings, or any other recombination that evokes interesting new ways of seeing.

⁴Both authors want to give appropriate credit to Andrew Burton-Jones' ground-breaking work on systems use and also shield him from attribution with respect to ideas expressed here that may ultimately strike the IS community as outside the pale. We highly recommend that scholars truly interested in use read Andrew's ICIS award-winning dissertation (2005) as a starting point for deeper studies on systems usage.

⁵This refers mainly to reflectively measured constructs, of course. Given the need to ensure the content of formatively measured constructs (Petter et al. 2007), the deficiencies identified next are even more serious.

⁶It might even be unconscious, which, of course, has huge research implications.

A fascinating scholarly study that leads us in this direction is an *MIS Quarterly* article by Agarwal and Karahanna (2000). They posit that the construct of “cognitive absorption” characterizes intensive use of systems; this is a form of usage that is very different from other ways of conceptualizing the human–computer interaction⁷ because it peers inside a person’s mind when they are engaged with a computer. The theoretical base on which this paper relies, in part, is the theory of flow. Imagine this flow as a process in which the computer system and the person become one (that is, atonement or at-one-ment).

We believe it is when humans “caress” the computer to evoke insight that makes this form of usage different. Certainly, we must learn (and utilize) the features of the system that are basic utilities. *Sine qua non*. Without which, nothing. But then we feel comfortable enough with these that we begin experimenting. We push the system at times and at other times cozy up to it. The melding of minds mechanical and organic leads to something that neither could do alone and this is a sort of sociomateriality that many researchers are becoming interested in, once again, today.⁸

New products. New services. New devices. New systems. All leading to a new and profoundly satisfying sense of something of value to us and/or to our organization. This is what Burton-Jones and Straub allude to as “deep structure” usage. It is likely akin to what Roberts et al. (2007) call “mindfulness.”

But individual use of systems certainly does not cover all the ground that the field studies. In fact, the “C” in ICT obviously refers to systems that go beyond the benevolent cyborg operating in splendid isolation to the benevolent cyborg operating within a network. Group use, therefore, is one other way in which people use systems. In group use, here again, we find a plethora of studies of surface structure usage, but few probing into how systems are used at the deepest structural levels. We turn to this subject next.

Group Use⁹

Groups either coordinate or collaborate when they jointly use systems (Burton-Jones 2005; Burton-Jones and Gallivan 2007). When they coordinate tasks, they simply push work off to others in a linear sequence. Systems for version control are examples of such mundane surface structure use.

Systems that support collaboration, however, create synergies (Burton-Jones 2005) in the way in which they draw upon the knowledge of the members of the group. The total realizations are larger than the sum of the parts. Members work in parallel (rather than linearly) but the system connects them and assists them in ways that they could not conceivably do via manual approaches or even with other non-computer-based technologies.

Examples might be negotiation support systems and shared repositories like knowledge-based management DSSs (Hosack et al. 2012). No doubt deep structure use is invoked in these systems because it is the interaction of minds of the group members with the surrogate minds represented in the system databases and software affordances that spark new ideas.

This kind of bifurcation of use plays out in other ways, in, for example, the fundamental difference between two views of “knowledge management” that arise in the IS literature. In order to manage organizational practice successfully, it is crucial to comprehend the way knowledge processes generate, and are in turn generated by, a localized work environment (Brown and Duguid 2000; Nonaka and Konno 1998). Within the social and cultural rules of behavior related to a community of practice, work-related knowledge is embedded (Alavi and Leidner 2001; Lave and Wenger 1991; Suchman 1987, 1996). However, the effective utilization of information and computer technologies to disseminate knowledge throughout widespread **workgroups** depends on the capture, codification and transfer of knowledge **among individuals** (Leibowitz 2001; Zack 1999). *Therefore, the use and transfer of organizational knowledge may be found where two modes of analysis overlap: (1) reflective engagement, in those local systems of social interaction, practice, and sensemaking that form organizational work, and (2) involvement in sensemaking and*

⁷See the argument in Burton-Jones and Straub for why Agarwal and Karahanna imply that cognitive absorption can also be envisioned as a use construct.

⁸*MISQ* has an upcoming special issue on sociomateriality that will, hopefully, greatly advance the field along these lines.

⁹There can undoubtedly be use at higher levels of abstraction, such as business units, divisions, product lines, organizations, trading groups, industries, countries, regions, and so forth. IS has traditionally focused on individual and group use and so we restrict our philosophizing to these simpler levels.

analysis, through which localized knowledge is externalized, reified, and made explicit (Buckland 1991; Johnson et al. 2002; Nonaka and Konno 1998).

Managers usually avail themselves of top-down information processing and create cognitive knowledge structures that make their information access easier; in simpler terms, they are able to generate manageable information sets (Walsh 1995). The range to which these knowledge structures extend goes from heuristics intended to generate decision-making short-cuts to simplification systems, where a low number of categories codifies a high number of information points (Schwenk 1984). We would surmise that the use of such systems by managerial units (or groups) constitutes deep structure use in many cases.

Can the differences between individual and group surface structure use and individual and group deep structure use be made clearer? These distinctions become more obvious when we take into account the modes by which information systems sustain individual tasks where interpersonal or computational communication is involved. Thus, in intra-organizational contexts, systems are valued according to the extent to which individuals utilize such technologies for recalling, replicating, or rebuilding knowledge for use by groups.

According to recent scholarly thinking, organizational knowledge or memory (used by both individuals and groups) is being increasingly embedded in software, or other similar media resident in computer storage. Integrated information systems, for instance, have centralized data repositories conceived to store and coordinate all knowledge and activities that take part in qualifying, designing, creating, manufacturing, and preserving an artifact throughout the extended organization and its whole life cycle. These repositories are intended to sustain the organization's capacity to store and integrate disparate knowledge sources. They allow the synchronization of disseminate processes and activities across the boundaries defined by functions, discipline and tasks. When these repositories spark new ways of thinking, they can be used for knowledge creation or generation and this would mean that the systems are being used at their deepest levels. Please see the Online Supplement for an expanded view of this line of thinking.

Conclusion

Arguably the most obvious manifestation of deep structural usage can be seen in the computer graphics that are transforming the cinema and entertainment industries today. We are on the verge of creating artificial/virtual worlds that are so lifelike that we will become easily lost in them and come to believe them to be true representations of the real world.

Computer graphics can defy physical laws with complete impunity. They can move a story line (or a line of thinking) in directions that traditional representations cannot. Going well beyond traditional costume dramas, people in our era can time travel to earlier periods where they can meet and interact with historical figures, they can be transferred to future eras and act within that speculative time, and they can easily perform feats that are beyond human capabilities.

Are there downsides to such a vision and such a reality? Of course. But there are incredible upsides. When hedonic (and haptic) technologies are fully utilized, customers and sellers alike will be able to understand each other better and agency problems will likely be minimized. Transactions will satisfy. Sellers will tell potential customers stories about products and services through the magic of computer animation. Buying will become a complete experience and not a mere response to persuasive (and hugely expensive and wasteful) advertising.

Are systems stretching our minds so that our reach will be able to exceed our grasp? Let's hope so. There are certainly mundane uses of systems and there are appropriate phenomena where this is the best way to measure the construct. But the greatest information acceleration occurs when systems radically change our thinking (via our manipulation of them) and we need many more scholars who have internalized and then go on to practice this view of use. In short, the field needs more profound thinking as to how we define, scope, and measure the use construct.

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Parting Thoughts on My Term of Office as EIC of *MISQ* (2008–2012) ████████████████████

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It has been my honor and privilege to serve the IS community as Editor-in-Chief of *MIS Quarterly* for the past five years. There are many I would like to thank for giving me this opportunity and for supporting me in this work. Among the many people to whom I owe a profound debt of gratitude are the members of the *MISQ* Policy Council (of 2007) who somehow sensed that there was a core of value and determination in my otherwise decidedly maverick approach to things. You know who you are. Please accept my thanks.

The Minnesota staff of Jan DeGross and Jennifer Syverson have been ever supportive as have my two Associate Managing Editors Chad Anderson and Darryl Romanow. Needless to say, there have been countless times when the talented *Quarterly* editors, reviewers, and authors (and my editorial coauthors) have played a formative role in helping me through the difficult decisions and tasks that any EIC has to fully engage with.

Finally, no telling of those who have been instrumental in a person's life would be complete without alluding to one final large group of persons with whom I have interacted. These individuals are located all over the planet, but what especially distinguishes them is that they have held the good of others to be their high and noble goal. These IS academics (and IS practitioners) have been gracious and accommodating to me as I have been privileged to visit and work with communities in locations as diverse as Tibet, New Zealand, Kuwait, China, Ethiopia, Peru, Vietnam, France, Norway, and South Africa. What has moved me most in these experiences has been that my hosts have, by and large, been trying in their own ways to improve conditions in their own local settings. Journals play a role in such improvement schemes in that they are the "coin of the realm." Every country wants to be part of this, our vital scholarly community, and many times my visits were positioned as a means by which locals could advance new, and challenging goals for their scholarly communities. Although I have always questioned whether EICs, as a result of their position, have any more insight into what ultimately gets published than anyone else, I greatly appreciate the symbolic value of these journeys and, thus, undertook often arduous trips even when schedules proved to be tricky.

There is a well-known adage that goes something like "Be careful about what you wish for or you might get it." This wholeheartedly applies to a long-term desire I have had to be *MIS Quarterly*'s Editor-in-Chief. I entered the IS academic and practitioner profession in 1979 as the director of a newly formed Computer Center at my then-current academic institution. Our charter was to completely convert the institution from manual to computerized systems (in a relatively short time frame of three years) and also to provide a vibrant set of academic offerings in information systems and computer science. Indeed, it was in these early days, when *MISQ* was itself a new journal, that I first began to appreciate the role that *MISQ* was eventually to play in our field. Thus, my insipient desire to lead the journal has probably been 30 plus years in the making.

By the early 1980s and studies for a doctorate in MIS, I became even more sensitized to the growing importance of the *Quarterly*. During my first professional appointment at the University of Minnesota, I had the treasured opportunity to serve as Associate Publisher of *MISQ* and gain an upfront view of the way journals run. Later, I was lucky enough to review for the journal and to serve in a series of editorial capacities. No one could ask for more than this in their professional life.

To incoming Editor-in-Chief Paulo Goes, I offer my best wishes for a successful editorship. He has all the talent and background that is needed for this position and if he receives the levels of support that I was blessed with, he will assuredly do a splendid job.

EDITOR'S COMMENTS – SUPPLEMENT

Software as Surrogate for Human Information Processing

Codification of organizational processes in software in the form of software embedded “routines” expand as a result of the progressive extension of software systems capabilities. Thus, software plays a pivotal role as a repository of organizational procedural memory. As advanced software systems are introduced, organizational processes or routines are increasingly embedded in software and managed by enforcing rules and constraints. These comprise the rules on which the integrity or reliability of a product or system are based, or its consistency and compatibility with other products and systems. They even include constraints of a legislative or regulatory kind or may be due to design requirements. All changes in the parts and model data, together with their relationships in the hierarchy or product structure, are regulated by software-embedded rules; changes are imposed since these rules act as normative criteria and in this way their feasibility is guaranteed. For instance, the software may be useful to assure the validity and concurrency of all changes enforced.

When a set of rules and constraints is embedded, software behaves as a “dual enabler” (Del Giudice 2008; Dell’Anno et al. 2006); some search spaces (i.e., spaces that are technologically or organizationally unfeasible) are closed while others (i.e., feasible spaces) expand. The aim of this function is to reduce the risk of reinventing the wheel, or impeding faults or inconsistencies to be discovered downstream in development, where the risk and costs of failure would be certainly greater. In fact, there is not an inevitable incompatibility between a large quantity of stored memory and innovation because the first does not necessarily result in core rigidities (Leonard-Barton 1995). If investigation is confined to technologically or organizationally feasible areas, the software-embedded constraints generally mean that only within feasible spaces creativity or experimentation are enabled. Thus, software allows while at the same time constraining. Nevertheless, another aspect of embedding procedural memory in software may be highlighted. Considerable efforts are often made to define and optimize current procedures and these anticipate the process of embedding organizational routines in software. Two steps are often implied by this operation: (1) existing processes are compared with a number of standardized procedures considered as industry best practice; and (2) existing processes are altered in order to move toward best practice and in this way they accomplish the full potential expected by the software.

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