



Systems, Signs & Actions

An International Journal on
Information Technology, Action,
Communication and Workpractices
Vol. 7 (2013), No. 1, pp. 82–89

<http://www.sysiac.org/>

Conceptualizing the SocioTechnical (ST) Artifact

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Abstract

Goldkuhl (2013) raises several interesting issues related to conceptualizing the IT artifact. Using his analysis as a starting point, we present four additional observations: (1) So-called "IT artifacts" have both technical and social design features and are therefore better regarded as "SocioTechnical (ST) artifacts". (2) Those who deploy and employ ST artifacts do so to achieve desired consequences while avoiding undesirable ones. Along with the ST artifact, consequences - positive or negative, whether intended or not - constitute a central but under-researched topic. (3) Studying the ST artefact - consequences connection has the potential to be a unifying force in the IS field. In particular, design science needs to integrate this issue into its study of ST artifacts. (4) The study and practice of anticipating ST consequences must not be limited to existing ST artifacts. Inventors must also anticipate consequences while designing new technologies that have yet to be instantiated.

Keywords: sociotechnical, design features, consequences, artifact

Received: 8 February 2013; Revised: 29 April 2013; Accepted: 17 May 2013
Accepting Editor: Brian Donnellan

1 Introduction

Goldkuhl (2013) takes on three tasks in his thought-provoking article, "From Ensemble View to Ensemble Artefact - An Inquiry on Conceptualizations of the IT Artefact":

1. interpreting the five views of IT (Information Technology) artifacts presented by Orlikowski and Iacono (2001),
2. critiquing Sein, et al.'s (2011) use of the term "ensemble artifact" when proposing Action Design Research (ADR), and
3. using these analyses plus a case study to offer an alternative view of the IT artifact, the "Communication Tool View."

Goldkuhl concludes that we should avoid conceptualizing the IT artifact too narrowly and, in particular, that describing an artifact such as his social welfare system necessarily includes such social elements as the intended users and procedures for use

(including, in this case, legal restrictions on information access). We concur and take the matter a step further, arguing that the social and technical features of an IT artifact demand equal treatment in both design and evaluation research and must be considered in conjunction with each other. Accordingly, in this commentary we define the IT artifact as a sociotechnical assemblage. Indeed, in the first Information Systems (IS) textbook, Gordon Davis (1974) defined an IS as comprising hardware, software, data, people, and procedures. Three of the elements are technical and two (people and procedures) are social.

2 From “IT Artifact” to “SocioTechnical Artifact”

To appreciate the significance of an artifact's social features, note that even without a change in the technical components, a change in a social dimension can produce a very different artifact. For example, a key dimension on which the new competence management system described by Lindgren, et al. (2004) differed from the old one was in the user. The old system, intended for use by human resources professionals, prevented individuals from viewing any skill profile other than their own. Had only that aspect of the sociotechnical ensemble been changed, the old artifact would have had very different social consequences. Likewise, to appreciate how the combination of a technical and social feature may matter, consider online forms that require information that the intended users cannot or will not provide. These users sometimes put garbage in the required fields, but this garbage becomes consequential when others draw on it as "information." Here, the technical design (required fields) and a social feature (the intended users) combine to make a difference.

Given these observations, we find it more appropriate to refer to what is often called an "IT artifact" as a "*SocioTechnical artifact*," or "*ST artifact*," for short. Referring to the "social aspects" of an "IT artifact," as is common practice today, creates an unfortunate asymmetry, subordinating the social design features to the technical ones. Indeed, the social design features of an ST artifact may be as important, or even more important, than the technical in affecting consequences. And the social design features, too, are created by humans, sometimes designed with care and other times established without sufficient consideration of their significance. For instance, a system may be designed with the technical capability for human overrides, but a key social design feature is which people are empowered to approve the overrides. Along the same lines, user training is a social feature of an ST artifact, not something that "accompanies" it. Indeed, designers have been known to simplify the interface design or embed additional guidance in environments with limited training (Markus, et al., 2002; Silver, 1991). Similarly, plans for such telecom services as cell phones and the "triple-play," which include pricing, duration, and early cancellation penalties, are an integral part of the ST artifact as consumers trade-off these social features with the technical ones (bandwidth and so forth). Giving the social features equal status with the technical features increases the likelihood that they will be considered explicitly, *and in conjunction with the technical features*, in the design and evaluation processes.

3 Toward a Broader Conception of “Consequences”

While there is much to comment on in Goldkuhl's rich paper, we are most taken by the implicit question underlying this article and others: "Toward what end are we

conceptualizing the ST artifact?" We certainly concur with Goldkuhl (2013), Benbasat and Zmud (2003), Orlikowski and Iacono (2001), and others, that the ST artifact is a central and potentially unifying element of our field. And we also agree that focusing on the artifact can help position our discipline vis a vis others as well as deepen our understanding of various technology-related phenomena. But more specifically, what do we hope to comprehend better? It has been said, "When you don't know where you're going, any road will take you there." Only by recognizing our research objective can we assess the relative merits of the various views of the ST artifact and can we conceptualize that artifact in a way that is productive.

We can infer from Orlikowski and Iacono's (2001) findings that individual research projects view the ST artifact in a manner consistent with the purpose of their studies. But what are we collectively, as a research discipline, as a community of scholars, trying to understand? As IS researchers in this technology-laden age we have no shortage of interesting phenomena that we could study. Indeed, over the course of a few decades the field has expanded to include a diverse set of interesting, yet somewhat loosely connected, topics. Ours is an applied field and there is much talk of the need for research that is relevant to practitioners, whom we define as both IT professionals and IT consumers (that is, hands-on users as well as others affected by the IT). Ultimately, what matters to those who deploy and employ IT are the effects of IT-related activity, which might be termed "ST consequences." By consequences, we mean not only performance and economic consequences, but also social and ethical consequences, positive or negative, whether intended or not (Markus and Robey, 2004; Boudreau and Robey, 2005; Walsham, 2012). Examples of consequences include such various outcomes as better (or poorer) decisions, increased (or reduced) income, improved (or impaired) health, greater (or lesser) employment, timely (or late) completion of tasks, saved (or wasted) money, greater (or lesser) social isolation, and reputational gains (or losses). Indeed, individuals and organizations expend time, money, and effort on IT because they hope to achieve the consequences they desire while avoiding undesirable ones. In addition to the ST artifact itself, therefore, ST consequences constitute a second central element of IS research.

With this conceptual starting point, the following pair of research endeavors pertaining to ST artifacts and their consequences can offer a central and potentially unifying focus for our field:

1. Understanding the full complement of consequences, intended and otherwise, of deploying and employing ST artifacts and explaining how those consequences arise and may be related to sociotechnical design features of the artifact, and
2. Creating substantive design practices that will enable designs of future ST artifacts and technologies to achieve desired or desirable consequences while avoiding those that are undesired or undesirable. By "substantive" design practices we mean not just design procedures but design approaches—some might call them design theories (Walls, et al., 1992; Markus, et al., 2002)—that reflect a substantive understanding of the connection between sociotechnical design features and consequences.

4 The Need for a Future Orientation as Well as Post-Hoc Analysis

Notice how the two endeavors are connected. The knowledge that the first produces concerning the connection between design features and consequences serves as a foundation for the second. Our goal in explaining how ST artifacts can be consequential is to use this explanation to enlighten or guide those who design, deploy, and employ IT and business processes (whether or not they are IT-enabled). Notice that the second endeavor is intended to facilitate not just developing new artifacts based upon existing technologies but also inventing fundamentally new and as yet uninstantiated technologies - for instance, the Internet 50 years ago or nanobots today. We have learned that radically new technologies offer substantial benefits while posing significant risks, both of which are unknown at the outset and reveal themselves over time. Today we are reaping numerous benefits from the Internet, but initial implementations of many unplanned-for applications of the web (such as on-line shopping, banking, and trading) were cumbersome and we continue to cope with such major problems as identity theft and cyberterrorism. We must try, therefore, to be proactive in anticipating consequences so that we can formulate designs that maximize the benefits and mitigate the risks.

As individuals and organizations engage in such activities as inventing new technical features, choosing among functional capabilities, packaging the components of a system, customizing IT products, pricing IT services, and determining ST policies and procedures, they need to anticipate the consequences of their choices—for example, the possibility that they have created problems in areas at some distance from the automated process or that they have ignored such important "non-functional" requirements as privacy or job quality. We believe that too little attention is paid to this critical aspect of sociotechnical design and implementation. And even those who try to anticipate consequences are impeded by an insufficient knowledge base upon which to draw. Of course, one can never fully anticipate consequences given the emergent rather than deterministic nature of such outcomes, a constantly changing and probabilistic world, the longevity of many technology-based systems, and the radical and discontinuous change that accompanies many IT innovations. Nonetheless, we can, and must, understand better the mechanisms that connect ST artifacts with their consequences.

Anticipating ST consequences is made all the more important and challenging because many of them are unintended side-effects of trying to achieve some other objective. These unintended side-effects have been under-researched, as research on ST consequences has concentrated far more on (a) whether or not a given system "meets user needs" or "succeeds" and (b) whether a given technical design feature leads to a specific set of predicted positive outcomes. Especially neglected in consequences research are *negative* side-effects that may accompany use of a system. But these unanticipated negative consequences are common and often impactful, many times offsetting or even overwhelming the positive ones (Markus and Robey, 2004; Boudreau and Robey, 2005).

To explain how ST consequences arise and may be related to the design features of an ST artifact, considering the following sequence of three questions may be helpful:

1. How are the design features of an ST artifact related to the patterns of its use—that is, if it is used, when it is used, by whom it is used, and for what purposes or tasks it is used?
2. If the ST artifact is used, how do its technical and social design features affect the way users behave as they interact with the artifact?
3. What are the consequences (immediate and higher-order) of how users behave while interacting with this artifact?

We are not suggesting that these questions have deterministic answers. We believe that the connection between the technical and social design features of an ST artifact and the behavior and outcomes that surround its use is emergent, varying from one case to another. Nonetheless, we believe that the connection is amenable to study and that research findings can shed light on the nature of the connection in ways that are useful both for understanding outcomes and for anticipating them. Understanding and especially *anticipating* outcomes is essential for designing more effective artifacts and engineering new technologies in the future. Indeed, these three research questions lead to a fourth, arguably the most important:

4. How can one design the technical and social design features of an ST artifact, or a new technology, to achieve desired and desirable consequences while avoiding those that are undesired or undesirable?

For us, addressing all four questions, but especially the last, is what "conceptualizing and theorizing the ST artifact" is all about.

5 Implications for IS Research and Design Science

Due in part to their connectedness and in part to their focus on the ST artifact and its consequences, these research questions not only focus our attention on a central issue that has been the subject of far too little research but they can be a unifying force in a field that currently suffers from fragmentation, despite the benefits that could accrue from greater interaction. For instance, many researchers study artifact "use" in terms of whether or not the artifact is used, but do not consider patterns of use, user behavior, or—most significantly—the consequences of use. And many who study consequences do not actually go back to the socialtechnical design features of the artifact itself as antecedents of the consequences they are studying, exploring perceptions of the artifact, instead. Consider, for example, the many articles that study IT adoption via TAM (Orlikowski and Iacono, 2001; Benbasat and Barki, 2007).

Coming from the opposite direction, design science focuses on technical artifacts and sees evaluation as assessing the correspondence between functional features and intended consequences. But design science needs a more sociotechnical focus and to be fully integrated with consequences research. The design science paradigm (Hevner, et al. 2004) agrees that technology and behavior are inseparable in an IS (citing Lee, 2000), arguing that an interplay is needed between design science and behavioral science, whereby "design science creates [technical] artifacts for specific information problems based on relevant behavioral science theory and behavioral science anti-

pates and engages the created technology artifacts" (p. 98). But the design science conceptualization of the artifact leaves its social design features to others (behavioral scientists). Given our observations concerning the nature of ST artifacts, we believe, as do Sein, et al. (2011) and Lindgren, et al. (2004), that separating the technical and social design features of an ST artifact is problematic and may account for many less than successful IT projects and numerous unintended side-effects of ST artifacts. While we find value in distinguishing technical and social design features, the consequences of ST activity often reflect combinations of technical and social design features—that is, the interaction between them—so designing or assessing the technical features independent of the social ones can lead to dysfunctional designs and inaccurate evaluations. Answering well our four research questions depends on considering jointly the technical and social design features of ST artifacts. Moreover, these questions require moving beyond "evaluation," which in design science (Hevner, et al., 2004) is defined in terms of utility, quality, and efficacy, to a consideration of consequences, positive and negative, performance-related and otherwise, intended and not. Furthermore, the design process needs to reflect greater anticipation of those consequences so that the designed artifacts are more likely to lead to desired and desirable outcomes rather than those that are unanticipated and undesirable.

6 Conclusion

In this commentary, we have built on Goldkuhl's (2013) observations by presenting four of our own that constitute our view of conceptualizing and theorizing the artifact in Information Systems research:

The ST Artifact: The so-called "IT artifact" has both technical and social design features. In general, these two sets of features are of equal importance and specific combinations of technical features and social features are often key to understanding and anticipating consequences. For this reason, we advocate employing the more accurate term, "ST artifact."

Consequences: While the ST artifact is central to IS research, the ST artifact matters because the consequences of its deployment and employment matter a great deal. ST consequences therefore represent a second central topic for research. Researching consequences is not limited to whether or not a given desired outcome is achieved. Research must consider both positive and negative consequences and must consider both intended and unanticipated ones. Understanding the ST artifact–consequences connection needs to be a focus of IS research, especially as a basis for anticipating consequences and thereby improving design.

New and Emerging Technologies: While the IS literature tends to focus on the design of specific ST artifacts, the same issues and concerns with respect to consequences hold for the invention of radically new technologies that have not, as yet, been instantiated. Anticipating the consequences of these new technologies, and taking those consequences into account when designing their technical and social

features, is even more important because their impact will likely be far greater and more widespread than that of a given artifact.

IS Research and Design Science: Because both the ST artifact and its consequences are central to the IS field, and because research regarding artifacts, use, and consequences is highly disjointed at this time, studying the ST artifact–consequences connection has the potential to be a unifying force. In particular, because the interaction of technical and social factors matters for anticipating consequences, and because attending to consequences is essential for promoting desired outcomes while avoiding undesirable ones, design science needs to embrace social design features as well as to engage in consequences research.

We concur with Goldkuhl (2013), and others, who argue that the ST artifact has a central place in the IS discipline. Moreover, we believe that well-focused research on the ST artifact can make a difference beyond academia, affecting how individuals, organizations, and society employ Information Technology and, most importantly, the consequences that ensue. We hope that we have provided here a frame for such research.

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