

Observing the Materiality of Values in Information Systems Research

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Abstract

Research focused on values in information systems (IS) is conducted using a diversity of approaches, methods and theoretical frameworks. This paper presents a systematic literature review to investigate the relationship between values and materiality—specifically, how researchers materialize values—in IS research. Analysis of the literature demonstrates that IS researchers perceive the values of research subjects in their language, attitudes, design, and practices. They also materialize values at different temporal points in the research process. These materialization choices are largely independent of research method, and are an important research design consideration. Conceptualizing the materiality of values can enable values researchers to be explicit about methodological choices regarding the observation of values.

1. Introduction

Information systems research is increasingly concerned with questions of the values and ethics of technology design and use. Dozens of HICSS papers in the last fifteen years investigate the values of technology design teams [22], users [14], and researchers [12]. These papers join interdisciplinary conversations variously called computer ethics [34], values in design [38], or value sensitive design [25].

Our project was initially motivated by a question of research methodologies and their underlying epistemological and ontological decisions: How do researchers know values when they see them? Work in psychology defines values as attributes held by individuals and frequently identified through self-report survey instruments [53,56]. Sociotechnical researchers have explored a range of more situated approaches to empirical values investigations [43,59]. As this area has grown, the methodologies used to understand values reflected in and through technology design and use have multiplied.

Because no scholarship to date has looked across these approaches to catalog the ways in which

researchers see evidence of values in their studies, we conducted a review to address the following questions:

1. How have values been observed in empirical information systems (IS) research and related fields in the last fifteen-plus years?
2. How have empirical methods for studying the role of values in technology design evolved over the same time period?

Our review builds on a connection between values-centered IS research and theories of materiality. We are interested in how values are observed by researchers through empirical research: the systematic study of observable phenomena. We seek to understand the perceptual markers that have been used to identify values in empirical studies, including the words, actions, or features researchers associate with values. Our position that values can be observed in research contexts is supported by references to values being “embedded,” “concretized,” and “materialized” in much of this work.¹ Our review demonstrates that research engaged with values in technology design, adoption and use is deeply bound up with questions about the material nature of technological objects.

We begin with an overview of values focused studies in the fields of IS, computer supported coordinated work (CSCW), HCI and computer ethics. Next, we review concepts of materiality that frame our analysis. We then discuss the methods we used to conduct our review. This is followed by a discussion of findings and implications for IS research.

2. Related work

In the last two decades, studies of values in information systems have appeared in computer ethics [e.g., 34,73], science & technology studies (STS) [e.g., 4,41], media studies [e.g., 26], and value sensitive design (VSD) [e.g., 23]. Building on foundational papers in these areas authored in the 1990s, inquiries into values in IS have taken the form of theory-

¹We note that this can be a controversial assumption [10]. However, this review demonstrates that many researchers believe there is a relationship between technological affordances and values.

building and philosophical work, design studies, and empirical studies conducted by researchers in ethics, computer science, information science and design.

Theory-building work has focused on defining values and exploring how values intersect with information systems [e.g., 68,73]. This work has also explored whether and how values are transferred from human actors to technological objects by designers as well as users [e.g., 51]. Theory-building continues to be an important part of the values and design tradition [e.g., 38].

Design-focused research is concerned with how values are exposed, negotiated, and introduced into technical features during the process of design [e.g., 43]. Values can be built in consciously or unconsciously by designers and are often concretized through affordances: features of a technology that make it better suited for some tasks than others [e.g., 26]. Design approaches that explicitly consider values can influence the visibility of specific affordances in resulting technologies [e.g., 22,57,59]. Design studies may seek to build particular values into systems [e.g., 63], or analyze systems for values-oriented affordances [e.g., 26].

Empirical research observes values as phenomena in the sociotechnical world. While empirical approaches to studying values in technology differ in method, theoretical framing, and context, these studies typically seek to make values visible to researchers and, at times, design stakeholders. Empirical work on values encompasses ethnographic work [e.g., 42], interviews [e.g., 32], surveys [e.g., 22], and content analysis [e.g., 30]. Studies investigate values as influences on behaviors, attitudes, moral judgments, and justifications for decisions [e.g., 53]. For example, IS researchers may study the way values shape the systems designers create [e.g., 22,59]. IS researchers also investigate how values guide technology use practices [e.g., 1,74].

By drawing attention to values as observable phenomena, empirical investigations surface the material nature of technology. There have been many complex and highly nuanced discussions of materiality within IS and STS, delving deeply into questions of the physical nature of digital artifacts [e.g., 10,15], technological agency and determinism [e.g., 41], and form, functionality and social practice [e.g., 45]. Drawing on these discussions, we sought to understand how researchers exploit material and observable aspects of artifacts and social practice to understand the role of values in technology design. Our grounded approach extended from three key concepts delineating aspects of the material nature of technological artifacts: materiality, sociomateriality and visual materiality.

2.1 Materiality

We view materiality as something that enables researchers to observe values in artifacts and practices. According to Leonardi, materiality refers to “the arrangement of an artifact’s physical and/or digital materials into particular forms that endure across differences in place and time and are important to users” [46:42]. The endurance of forms over time is often tied to values through the concept of affordances: particular material arrangements that make some actions easier or harder, valuing some outcomes over others [28,36]. While perspectives on materiality generally see the material nature of technology as a powerful driver of use, they do not typically view it as strictly deterministic: the material properties of an artifact enable it to be deployed, adapted or appropriated in ways deeply influenced by social practices [50]. Further, human experience “materializes” through the functional character of technological objects. There are ways in which the “intrinsic functional identity of technological objects” [46:9] can be viewed as an anchor for the performance of human activity in a situated context.

Dourish and Mazmanian [15] synthesize five dimensions of materiality. These dimensions share a recognition that “the ineffable ‘stuff’ of digital abstractions is encountered only ever in material forms, and the nature of those forms has consequences for how information practice develops” [15:8]. The first dimension is the material culture of digital goods, for example, people’s responses to, love for, or fetishization of technologies. The second is the transformative materiality of digital networks, such as the impacts of surveillance technologies on people’s everyday lives. The third dimension relates to the material conditions of information technology production, for example, the power relationships on a design team or in device manufacturing. The fourth is the consequential materiality of information metaphors, such as the widespread valorization of data-oriented ways of knowing. The fifth is the materiality of information representation, for example, visualizations of data, or storage of digital data on material forms such as hard drives.

2.2 Sociomateriality

Sociomateriality is an extension of materiality theory that conceptualizes the “temporal meaning, boundaries, and properties” that result from entanglements of technologies, people and organizations [2:22]. Technological objects are not, in themselves, sociomaterial, but the practices in which objects are embedded unfold within space created by

the entanglement of the social and the material [50]. In their work exploring the relationships between sociomaterial theory and design, Bjørn and Østerlund [2:22] identify several dimensions of sociomateriality including the inseparability of the social and the material, the need to establish a relational ontology to ground inquiry because what is social is also material, and the need to conceptualize the material and the social as performed together. By extension, values expressed through relationships, conventions and norms are inseparable from the values reflected in material arrangements. The concept of sociomateriality can be challenging to operationalize because of the deeply entwined nature of its essential components. Bjørn and Østerlund explain the empirical implications of these entanglements:

“We can no longer regard any of these artefacts as being pre-determined and stable. Instead, their boundaries are dynamic and created by the practitioners at different points in time, for particular purposes...” [2:103].

2.3 Visual Materiality

While sociomaterial practice has been conceptualized as an entanglement [50] or imbrication [44], Jacobs, Cairns and Strebel describe in their work the confluence of the social, physical and technological as a “reverberation between visibility and materiality” [33:134]. In their exploration of modernist ideals in the design and construction of tower block apartments in mid-century Glasgow, they reflect on the ways in which values of a particular period are enacted and made visible through material choices regarding the size, location and construction of windows. They argue that, not only do design choices reflect the values of designers and architects within a particular historical moment, but the material nature of the windows and the views that they enable force those values to be reckoned with long after they have passed out of vogue. In the case of the tower block, this visual and material persistence is characterized by decay, occlusion and disrepair, values antithetical to those that inspired modernist design principles.

Literature on visual materiality argues that we make things (information, points of view, states of being, values) visible through the co-constitution of perception, material affordances, and situated meaning, establishing an “ecology of the visual” [54:4]. Visual studies scholar Claudia Mitchell refer to this as “doing the visual” [48]: the process of drawing awareness to distinct social and material performances and understanding how the visible persistence of those performances has social and political implications.

The literature on visual materiality raises three important questions for studies of values in IS [54]: 1) what are researchers observing, 2) how do these perceptible markers signal values, and 3) what are the political and social implications of those associations? In order for researchers to recognize values during systematic inquiry, there must be material indicators of values that persist at least long enough to be recognized as evidence. This review is intended to provide a sense of the range and qualities of visible and material markers of values, as well as the methods used to observe and document them.

3. Methods

We undertook a grounded review of empirical studies of values in IS research to answer two primary questions: How have values been observed in IS and related fields over the last fifteen-plus years? And how have methods for studying the role of values in technology design evolved over the same period?

Our review began with the last fifteen-plus years (2000-2015) of papers from the Hawaii International Conference on System Sciences (HICSS) and the ACM Conference on Computer Supported Cooperative Work (CSCW). We chose these venues for their reputations for hosting empirical work on information systems. We selected the years 2000-2015 to consider work that drew upon and expanded foundational 1990s-era papers in computer ethics, values in design, and VSD. We restricted our search to full papers that observed, collected, and/or analyzed evidence of values. To identify salient works, we used a combination of keyword searching and citation cross-referencing. We searched for the keywords “values,” “ethics,” and “materiality” in paper titles and examined abstracts in order to identify relevant work that was primarily empirical in nature, i.e., based upon systematic observations of the world. As such, we removed conference workshop proposals, panel position papers, and primarily theoretical work from our collection. For example, we removed Borning & Mueller’s important “Next Steps for Values-Sensitive Design” [3], categorizing it as a work of persuasive theory rather than a study that systematically observed values.

We then examined the bibliographies of the resulting empirical papers to identify additional work, resulting in two additional stages of data collection. First, we determined that a substantial number of the works cited came from the ACM Conference on Human Factors in Computing Systems (CHI) and the journal Ethics and Information Technology (Eth IT). We expanded our search to include research from those venues using the same keywords. Titles and abstracts of the resulting articles were examined for relevance

and those deemed salient (empirical full papers) were added to our repository. Second, we mined the citations of all papers in our repository (from HICSS, CSCW, CHI and Eth IT) to identify relevant studies not captured in our keyword search. This included value-centered works that were published in one of our four primary venues but did not include the search terms in the title. We also identified a small number of frequently cited papers not published in HICSS, CSCW, CHI or Eth IT.

Overall, we reviewed approximately 230 papers which yielded 99 empirical full papers. This included 17 HICSS papers, 24 CHI papers, 19 Ethics & Information Technology papers, 10 CSCW papers, 5 ASIST papers, 2 ECSCW papers, and 22 papers from other venues. A full list of papers analyzed is available at <http://evidlab.umd.edu/?p=87>.

We conducted a systematic, grounded review of the studies using an iterative, inductive coding process that resulted in a set of four primary dimensions for coding studies (Table 1). We based the first two dimensions on standard analyses of empirical work: (1) the reported methods, and (2) the theoretical framing, based on the conceptual and/or analytic frameworks used to explain or justify the research. Exemplars of study types included ethnographic observation and interviews as in [5] and structured survey data collection as in [61]. Exemplars of theoretical framings included an explicit focus on individual human values in [9], the focus on the values of organizations in [69], or the acknowledged VSD framing in [24].

The next dimension focused on how researchers reported evidence of values: (3) the form of values-

centered material associations, based upon specific markers or indicators of values that enabled data collection, observations and/or analysis. Materialization of values occurred through: language and discourse surrounding the technology artifact (as exemplified in [20]); features or functionality prioritized in the design process (as described in [7]); and social practices related to technology adoption, adaptation, and appropriation (e.g., [1] and [47]).

The final dimension sought to capture a sense of (4) the timing of material associations during the research process. Depending on research methods and theoretical orientations, values were sometimes operationalized (i.e. made material) *before* data collection or engagement with participants as part of instrument or protocol development (as in [30]); sometimes *during* data collection or engagement with participants through grounded or participatory activities (e.g., [72]); and sometimes *after* data collection or engagement with participants through *post hoc* analysis of a case or technology (as in [78]).

Within each dimension of interest, we iteratively developed a series of codes based on multiple reads of each paper (Table 1). The literature on sociomateriality prepared us for the entangled nature of social practice, values concepts and observable phenomena within empirical research. Our goal for this initial research was to develop an inclusive picture of these entanglements, rather than delimit independent features. Therefore, studies that reported multiple frameworks, material forms of values, or timing of material associations received more than one code. For example, studies such as [21], which examines the

Table 1. Codes and examples

Dimension	Code	Examples
Type of study	Qualitative	Ethnography
	Quantitative	Machine learning
	Mixed methods	Ethnographic study with attitude survey
	Design	Value Sensitive Design
	Theory	Abstraction from case study
Theoretical framing	Human values	The values of people
	Materiality	Material properties
	Organizational values	Values of groups
	Philosophical ethics	What should be done
	Computer ethics	Applying certain ethics (e.g. privacy) to information systems
	User centered design	Learning from users
	VSD	Building values into technology
VID	Intersection of values and technology	
Form of material associations	Language	Values in online discourse
	Practice	Values in social rules
	Attitudes	Portrait Values Questionnaire (PVQ)
	Design	Privacy settings
Timing of material associations	Before	Values associations made before engagement with participants
	During	Values associations through engagement with participants
	After	Values associations made after engagement with participants

Table 2. Results of coding

Code	Count
Methods	
Design	16
Mixed methods	18
Qualitative	34
Quantitative	9
Theory-building	17
Theory	
Human values	22
Materiality	7
Organizational values	3
Philosophical ethics	7
Computer ethics	15
User-centered design	7
VSD	16
VID	5
Form	
Attitudes	12
Design	28
Language	18
Practice	33
Unspecified	1
Timing	
Before	4
Before + After	28
Before + After + During	8
During	9
During + After	8
After	31

values of individuals and values built into design, received multiple frameworks codes. Studies such as [31], which studies facial recognition systems in design and practice materialized values in both design and practices. And studies such as [17], which studied the values of authors in Usenet groups, materialized values of interest before the study in a conceptual analysis, during the study through real-time user evaluation, and after the study through iterative data analysis.

4. Findings

Findings from our review reflect the heterogeneity of empirical values studies (Table 2). The data indicate that the number of studies have increased over time (see Figure 1), and with this growth comes consistent diversity (rather than convergence). The papers used a range of theoretical frameworks and methods, and identified values in a variety of sociomaterial forms.

4.1 Methods deployed

Our review reflected a broad range of methods. While qualitative studies were the most represented,

there were also large numbers of mixed-method, design, and theory-building studies. Quantitative studies were the least represented. A majority of CSCW papers included were qualitative studies; and a majority of Eth IT papers were theory-building. CHI papers had the same diversity of methods as HICSS papers, incorporating qualitative, mixed-method and design studies in roughly equal measures.

We noted some relationships between methods and the materialization of values. All but 4 of 16 design studies saw values materialized through design activities. A slight majority (53%) of qualitative studies materialized values in practice; however, a large minority (32%) saw values materialized through the features and functions of technology objects. Less prevalent were qualitative studies that reported seeing evidence of values in attitudes or language. Both quantitative studies and studies using mixed methods, however, were evenly divided between seeing values in attitudes, language, and practice.

4.2 Theoretical frameworks

A majority of the papers identified themselves as using value sensitive design [e.g., 13,75], studying values in design [e.g., 19,22], or studying human values [e.g., 30,71] or the values of individuals [e.g., 5,32]. Though most papers studying values of people focused on individuals, a handful focused on the values of organizations [e.g., 69,76]. A sizeable minority of the papers focused on computer ethics: applied papers describing what information systems should do (e.g. papers focused on protecting privacy) [e.g., 62,77]. We identified a few papers ruminating on what constitutes moral attitudes, design, or practice in the context of philosophical ethics [e.g., 52,65]. A small number of papers focused on materiality [e.g., 40].

4.3 Observable material character of values

Researchers saw values in diverse material forms. The largest group of papers described values in practices. For example, Kirk and Sellen [37] examined values in people's archiving practices, and Shih et al. [58] studied values in the practice of time banking. The second largest group read values into design features. For example, Kraemer et al. [39] examined ethical properties of algorithms, and Stark et al. [64] identified values such as autonomy, privacy, and usability in cloud storage functionality. A large minority of papers found values in language. Chen et al [9] ascribed values to categories of words. Cheng et al [8] found values in congressional testimony. The smallest set of papers measured values through self-report of attitudes.

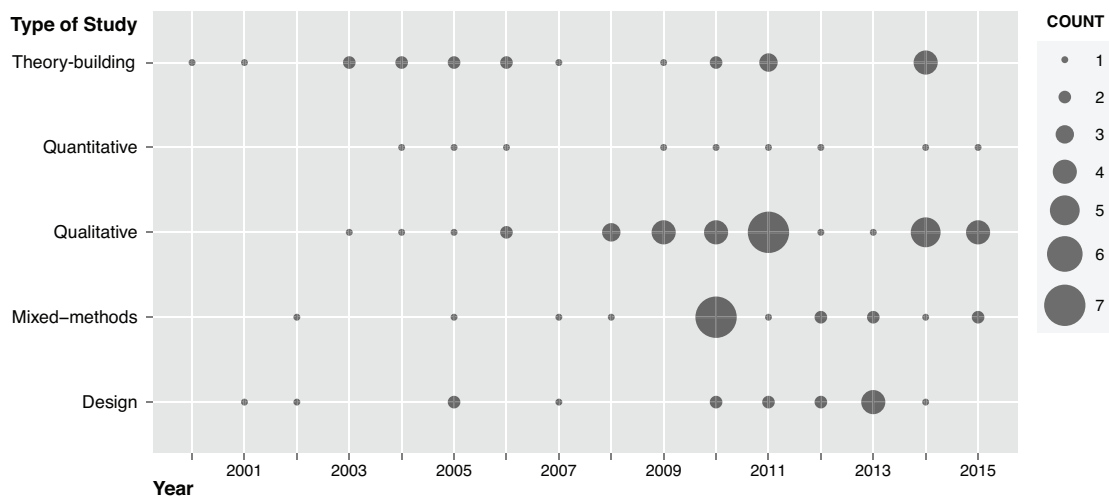


Figure 1. Frequency of types of study by year, 2000-2015

What is and is not a value in any context is a slippery topic, and researchers expressed their certainty about values indication in different ways. Papers finding evidence of values in practice, design, language, and attitudes differed in terms of the certainty expressed by researchers regarding the reliability of values indicators. Researchers studying attitudes and language largely used prescribed, well-established taxonomies of cultural values [e.g., 29] or socio-psychological values [e.g., 56]. Studies that found values materialized in design features, on the other hand, defined a wide range of values, from hedonic and utilitarian values of a technology to its users [e.g., 6] to openness and simplicity in a prayer app [e.g., 27] to the value of safety [e.g., 75]. Studies focused on values in practices had a similar diversity of definitions of values. Some of these studies relied on established values frameworks such as Rokeach's [53], but other studies focused on emergent values ranging from transparency [e.g., 66] to well-being [e.g., 35] to family connection and middle-class anxieties about setting technology limits for children [e.g., 1].

4.4 Temporality of values visibility

We analyzed not only the material character of values in the studies, but also *when* researchers reported seeing values during the research process: before, during or after becoming involved with research participants or conducting data collection.

Some researchers described making associations between values and specific material objects, practices or language *before* engaging participants or analyzing data, for example when designing surveys or interview protocols based on existing frameworks or models [e.g., 16,67]. A few studies identified elicitation tools intended to catalyze engagement with respondents before participant observation and field work began [e.g., 70,71]. In these cases, researchers made initial

judgments about what objects might evoke values-centered discussions. Even in stakeholder-centered methods such as VSD, there was often an initial period during which the researcher conceptualized key values in a particular domain before engaging with participants [e.g., 25]. Automating the process of values detection required models for making associations between text and values to be constructed before processing began [e.g., 20].

Design studies frequently evoked material aspects of values *during* engagement with participants. Methodologies such as participatory design and VSD engage with stakeholders throughout the research process [e.g., 11,55]. Investigators using grounded theory methodologies [e.g., 49] and active participant observation [e.g., 40] defined values in similar ways. In these cases, researchers consciously used material objects and practices to represent emergent concepts, mediate interactions with participants, and elicit responses in the service of values discovery [e.g., 43].

Most of the studies we reviewed involved *post hoc* analysis of material indicators of values *after* primary engagement with participants or data collection. Historical cases were analyzed to support conceptual, theoretical or philosophical arguments [e.g., 39]. Other studies involved gathering primary data through surveys [e.g., 14], interviews [e.g., 13], or field notes [e.g., 70] before making connections between materiality and values during analysis. We were struck when authors used phrases similar to, "Data was coded for values" when describing *post hoc* analyses without providing details of explicit operationalizations.

5. Discussion

We began this exploration of values and materiality with the question: How do empirical researchers know values when they observe them? We anticipated

finding patterns linking methods of inquiry to the ways in which values were conceptualized, operationalized and materialized. What we found was a collection of frameworks and methods for observing values that is growing but not converging.

Diversity held as a theme throughout analysis of the papers. Papers that materialized values in practices were just as likely to use a human values framework as a computer ethics framework. CHI papers were split largely between examining values in design and in practice; CSCW papers examined values in design, language, and practice; and HICSS papers displayed the most diversity, incorporating papers that examined values in attitudes, design, language, and practice.

The entwined nature of the social, material, and visible aspects of values-centered inquiry contributes to a rich and varied set of approaches blending qualitative and quantitative techniques, engaging participants at many stages of the research process, and relying on multiple material representations of values. One explanation for this multiplicity can be found in Bjørn and Østerlund's views on sociomaterial design [2]: the boundaries around these practices are not pre-determined or stable but instead dynamic, emerging at different points in time, and highly dependent on situated social practices.

This review examines the ways in which researchers characterize methodological decisions while negotiating the lived space in which values are expressed. Reflecting upon the range of decisions evident in these studies, we found three themes particularly relevant for the discussion of values and materiality: (1) the ways in which researchers characterized choices regarding the timing of values materialization, (2) challenges of participation and intervention, and (3) implications of highlighting values through observation.

Two primary components of the decisions faced by values researchers involve identifying the *object of attention* (where one should observe to find values, and what values one identifies when one observes there), and the *timing of the materialization of values* (when during research to make associations between an observable phenomenon and specific values). Decisions regarding attention and timing are one sociomaterial influence on values research.

Researchers who focused on finding values in language or self-reported attitudes often reported identifying a precisely-defined range of values in the beginning of the research process and then incorporating these into instruments and protocols. For example, we found studies in which researchers adopted a schema like Schwartz's Human Values inventory [56], which identifies ten key values, early in the research process. Such schemas provided scaffolds

for defining values, designing the protocol, and guiding summative conceptualization. Other researchers chose to take advantage of the discursive stability of the historical record, applying a values framing to discourse (language) in a post-hoc reflective analysis.

On the other hand, many studies that observed values in practices involved iterative refinement and redefinition of values. This approach required researchers to be attentive to material variations in values-centered practices throughout the research lifecycle. These studies were therefore less likely to identify an *a priori* list of values of interest, or iterated on such schemas as the study progressed.

Both *a priori* and *ad hoc* values approaches present opportunities and risks [18]. The sociomaterial nature of values means that they can be observed in many ways, at many times. IS research needs all of these approaches to achieve a holistic picture of the many ways that values influence technology design and use.

Another key theme in our findings was relationships between values materialization and the participatory character of research. Values of an individual or a community influence problem prioritization, resource allocation, and evaluation of solutions. This is as true for the participants in values-centered studies as it is for the individuals who conduct the research. Researchers' own principles and beliefs impact their approaches to the operationalization of values. This is not only a question of whether researchers should intervene in a setting, but also: to what degree does doing values research *become* intervention by casting a spotlight on values mechanisms? By articulating values as sociomaterial objects, is all values research participatory research? This is a question engaged in the larger sociomaterial design literature as well. As Bjørn and Østerlund ask:

What if we agree on the sociomaterial complexities of organizational practices, but do not simply want to stand passively by watching? What if we want to innovate and change organizational practice with the best intentions and without cutting essential relations? [2:104].

These questions echo the motivations of many values-centered researchers and designers engaged with sociotechnical issues of ethics, social responsibility, accessibility, and cultural difference. This is the challenge of "doing values" during research.

Reflecting on the participatory implications of values research means engaging with how researchers observe values mechanisms, how they interpret these signals or markers of values, and the implications of these associations. Though researchers made explicit claims about their choices of method and theoretical framework, visual materiality suggests that we go

beyond these choices to focus on values perception: how and when researchers make connections between material, observable phenomena and values. Though previous work has linked research methods to characteristics of how researchers see values [60], our review demonstrates that materialization and perception of values have no strong ties to either research method or theoretical framework. We may need to think of values perception as a distinct element of research design requiring specificity while planning empirical investigations. How researchers observe values matters to the politics and impacts of their work, but documenting the perception of values is a less acknowledged step in the values research process.

6. Limitations and future work

This paper presents a grounded analysis, and therefore an emergent rather than highly codified view of the values literature in IS. This approach exposes the breadth of the field, however it prevents statistical analysis of correlational relationships among variables. The grounded coding scheme developed here provides opportunities for researchers to revisit this literature with a more tightly delimited coding scheme in order to conduct statistical analyses of trends over time. This work also studies papers—formalized presentations of research—rather than research in action. This qualifies our understanding of the temporality of values observations, as researcher reports of when and how values were observed may differ from action in context.

Finally, this review presents a qualitative analysis of a representative but not comprehensive set of values literature in IS. Future research incorporating a broader array of IS literature (e.g. from the management sciences or media studies) might reveal an even greater diversity of values materializations. A broader materiality perspective also suggests questions for future work. How persistent are material representations of values in research (i.e., can we see values decay or bloom over time)? Does persistence vary for research on values in practice, design, language, or attitudes? A materiality perspective also raises the question of the transformative effects of materialized values. While participatory modes of research purposefully impact communities, it seems likely that non-participatory values research has similar (perhaps unacknowledged) observer effects.

7. Conclusion

Across the values-centered studies reviewed here we see a loosely associated selection of work that seeks to capture the complex, dynamic, and, at times,

ephemeral nature of values in the wild. One source of this complexity is the sociomaterial nature of values. Another is the research challenge of both having values and also studying the values of others. This review documents IS research that attempts to study values while “doing values.” By looking at researchers’ decisions regarding the timing of values materialization, the material objects of attention, and the observable aspects of values, we can see these tensions more clearly. Framing values research in terms of materiality can enable values researchers to be much more explicit about their choices when making values observable and perceptible.

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