Adapting Ethical Sensitivity as a Construct to Study Technology Design Teams

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The design of new technologies is a cooperative task (between designers on teams, and between designers and users) with ethical import. Studying technology development teams' engagement with the ethical aspects of their work is important, but engagement with ethical issues is an unobservable construct without agreement on what observable factors comprise it. Ethical sensitivity (ES), a construct studied in medicine, accounting, and other professions, offers a framework of observable factors by operationalizing ethical engagement in workplaces into component parts. However, ES has primarily been studied as a property of individuals rather than groups and in professions outside of computing. This paper uses a corpus of 108 ES studies from 1985-2020 to adapt the framework for studies of technology design teams. From the ES corpus, we build an umbrella framework that conceptualizes ES as comprising the moment of noticing an ethical problem (recognition), the process of building understanding of the situation (particularization), and the decision about what to do (judgment). This framework makes theoretical and methodological contributions to the study of how ethics are operationalized on design teams. We find that ethical sensitivity provides useful language for studies of collaboration and communication around ethics; suggests opportunities for, and evaluations of, ethical interventions for design workplaces; and connects team members' backgrounds, educational experiences, work practices, and organizational factors to design decisions. Simultaneously, existing research in HCI and CSCW addresses the limited range of research methods currently employed in the ES literature, adding rich, contextualized data about situated and embodied ethical practice to the theory.

CCS Concepts: • **Human-centered computing** → **Computer supported cooperative work**.

Additional Key Words and Phrases: ethics, group work, technology development

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1 INTRODUCTION

How teams of technologists consider ethics during design and development has become a matter of public concern and substantial research. Increasingly, researchers and the public have demanded that ethical reflection become a central part of computing. Current research in HCI and CSCW engages with this challenge by studying how technologists 'do' ethics during design, framing ethics as a team practice in the tradition of studying design work practices [14, 35, 51, 53, 103]. CSCW and HCI work has studied situated aspects of design that impact values and ethical implications. For example, Chivukula et al. [20] found five organizational and practice-based dimensions that influence designers' ethical awareness and understanding, ranging from the positionality of the

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Fig. 1. Stages of Ethical Sensitivity

design task within the enterprise to designer and stakeholder education. Shilton [85, 88] has described work practices that surface ethics discussions on design teams as values levers. And many HCI and CSCW researchers have created artifacts and interventions to encourage technology designers to notice and engage with ethical issues in their work [31, 86]. For example, Wong et al. [103] and Baumer et al. [7] have used design fiction to elicit “contextual, socially-oriented understandings” of values and ethical implications of potential features among designers. Value-sensitive design methods [34] and card sets evoke, engage, or elicit values during design, helping designers to make their values concrete [5, 33, 63]. Gispén offers tools and exercises designed to develop moral sensitivity, moral creativity, and moral advocacy among designers [37].

Ethics as part of professional practice, with or without outside intervention, has also been studied extensively outside of computing. In particular, the framework of ethical sensitivity (ES) focuses on how professionals recognize, interpret, and make ethical decisions in their work [98]. The ES framework lends itself to studies of practice by focusing on the processes that scaffold ethical decision-making: research that asks not if professionals are ethical, but *how* and *when* they engage in ethical practices and decisions, and how work might be adapted to encourage ethical practices. And because there is a well-developed literature on ethical sensitivity in professions outside of computing, this framework has the advantage of clear conceptual definitions: both shared indicators of the otherwise unobservable construct of ethical sensitivity, and methods to study those indicators. We draw on previous conceptual analyses of ES as well as a systematic review of empirical ES studies to condense the wide range of proposed attributes of ethical sensitivity into three umbrella components: recognition, particularization, and judgment (Figure 1). First, workers experience recognition of a potential ethical issue in their daily tasks (perhaps prompted by an external cue or internal affectivity). Workers then, individually or in teams, particularize the details of the situation through reflection (e.g. on their personal values) or information seeking (e.g. finding external guidance such as codes of ethics or opinions of peers and managers). Finally, workers use the understanding they build to make judgments about what to do. Recognition, particularization, and judgment offer defined activities to observe and measure for HCI and CSCW researchers interested in evaluating ethics interventions, describing a team’s ethical practices, or understanding the impact of design complexity, organizational factors, and other variables of interest on design decision-making. The ES framework can help CSCW and HCI researchers systemize both where to look for ethical practices, and how to test interventions the ethical practices of technology designers.

Our review of the methods and indicators widely used to study ES also reveals two important limitations of the existing ES literature for studying ethics in technology design. First, ES has been studied almost exclusively as a property of individuals, rather than groups. This makes sense in many of the contexts in which ES has been studied (e.g. accounting, in which a single person might notice malfeasance and decide to take action), but doesn’t fully encompass ethical decisions in technology design, where decisions are frequently made by and within teams. Second, the current methods that dominate the ES literature neglect aspects of work practice particularly important within HCI and CSCW: the situated and embodied nature of technology design work [24, 69, 93]. In

Fig. 2. Papers by professions and years

addition to adapting and refining a useful framework for studying ethics during the team practices of technology design, this paper highlights opportunities for HCI and CSCW research to offer rich, situated data from contextual methods to the study of ES. Our paper proceeds as follows: Section 2 describes our systematic review of the ES literature. Section 3 describes how we condensed the many concepts that make up ES into a framework for studying ethics in technology design. Section 4 then explores the methods and indicators most frequently used to study the three umbrella components of ES. Section 5 returns to the HCI and CSCW literature, using existing studies of ethics work during technology design to discuss the limitations of existing ES methods and demonstrate how HCI and CSCW enrich the ES literature. Section 6 discusses recommendations for social computing researchers interested in employing ES as a framework to guide their research.

2 CONSTRUCTING THE ES CORPUS

We began our analysis of the ES literature with review articles [9, 55, 98, 99] to better understand the history and context of the theoretical framework and to develop a search vocabulary for our systematic literature review. The review articles revealed that: 1) ethical sensitivity has been studied in numerous disciplines; 2) what is now called “ethical sensitivity” was originally conceptualized and is sometimes still studied as “moral sensitivity;” and 3) existing review articles did not include an explicit discussion of indicators or methods used to operationalize ethical sensitivity.

Based on our analysis of the review articles, we searched Google Scholar for papers in English containing either ethical sensitivity or moral sensitivity. This query returned 34,800 search results; however, cursory inspection of the results pages determined that many of these papers discussed ethics and sensitivity in separate contexts. Searching for “ethical sensitivity” or “moral sensitivity” as phrases and excluding citations narrowed the results returned to 16,300. Next, we used the title

Table 1. Data Collection

Column	Description
Profession	What industry does this study address? i.e. "Medicine" or "Accounting." "Business" is used when the paper uses it (i.e. studying MBAs). "None" is used when the study attempts to generalize to all workers or to people outside of a work context
Jobs	Specific jobs the paper is attempting to generalize to. i.e. "Nurses" or "Doctors." "Students" is only used if the paper attempts to generalize to students within the profession "Education." Papers using students to generalize about the profession they are studying (i.e. nursing students) the job are labelled (Nurses) and the use of students is recorded.
Sample	Number of participants in the study (range: 2 to 1,971, mean: 246, median: 165)
Method	Category of methods employed. i.e. "interview" "experiment," or "survey"
Stimulus	The item participants will respond to. i.e. "scenarios" "survey items" or "reflection questions"
Measure	The name or citation for the measurement of ethical sensitivity, including citations not included in the corpus. If the paper uses a unique method, its own citation is used in this field. i.e. "REST," or "Lind, 1993."
Data Type	The format of data collected. i.e. "free response," "brain imaging," or "Likert"
Conclusions	Summary of the study's results

and the text snippet surrounding the phrase of interest returned by Google Scholar to limit the corpus to empirical studies of ethical sensitivity. We excluded papers that were not empirical, papers that referred to ethical sensitivity in related literature but did not study the concept themselves, and studies about ethical judgment alone unless they were framed as ethical sensitivity. We also excluded papers that referred to the "ethical sensitivity" of technologies rather than people. Many search results were in languages other than English, or were duplicates of papers already in the corpus. Many review articles were returned in this search as well, and those were retained for reference, but not included in the corpus. These designations were usually clear from the text snippet, but in a few cases, we read the abstract to make a final determination for inclusion.

We used the resulting list of empirical studies to conduct citation chaining, searching reference sections for the keywords "sensitivity," "perception," "recognition" and "awareness." Combining empirical papers that focused on the phrases "ethical sensitivity" and "moral sensitivity" with empirical papers found through citation chaining rendered a list of 336 papers. As we read through these articles, we noticed some papers we judged to be of low quality (e.g., papers that included conclusions in the abstract that were not addressed in the methods or results, or papers published in venues included in Beall's list of predatory journals). We also discovered clusters of papers in regional journals that primarily cited other papers from their geographic region but were not well-connected to the international literature. We developed the following additional criteria for inclusion: papers must be peer-reviewed (excluding notes, dissertations, and most book chapters), must be from a journal with international readership and scope, and must be in a journal indexed by Scopus with a CiteScore of 1 or higher. On the first pass, 208 papers were removed: 36 dissertations, 69 papers in regional venues, and 103 whose publisher did not meet our CiteScore requirement. We confirmed that these criteria filtered out papers in predatory journals. Although these criteria

Table 2. Labeling Recognition, Particularization, and Judgment

Activity	Description
Recognition	a. Does the paper’s measure of ES capture any aspect of recognition? b. A description of how elements of recognition are measured.
Particularization	a. Does the paper’s measure of ES capture particularization? b. A description of how elements of recognition are measured.
Judgment	a. Does the paper’s measure of ES capture particularization? b. A description of how elements of recognition are measured.

may have unintentionally eliminated a few high-quality papers, we are confident that our corpus represents the range of methods and indicators used in current ethical sensitivity work. As we read through the remaining papers, we removed several more review, methods, and theory articles; the final corpus was comprised of 108 papers published between 1985 and early 2020.

We read each paper and coded it for profession, jobs, sample size, methods, stimuli, measures, data type, and conclusions, as described in Table 1. Our final corpus reflected studies of wide variety of professions including medicine, psychology, accounting, education, law, journalism, and marketing (see Figure 2). These papers were published between 1985 and 2020 and studied between two and 1,971 participants. Research was conducted in the United States, Korea, Japan, Norway, Brazil, Turkey, China, and Taiwan among nurses, doctors, dentists, counselors, physiotherapists, managers, marketers, market researchers, insurance salespeople, accountants, teachers and students.

3 CONCEPTUALIZING ES

Review articles [9, 55, 98, 99] revealed a striking variety of conceptualizations and operationalizations of ES. Review authors note disagreements about “its definition, its characteristics, the conditions needed for it to occur, or the outcomes to professionals and society” [98] and cite these conflicts as sources of inconsistent and confusing study results [73]. As we discussed ES and coded papers, we began building an understanding of ES as consisting of three high-level activities: recognition, particularization, and judgment. After discussing this emergent framework, we used it to code the corpus of empirical studies to test and confirm that these three categories were both distinct and comprehensive. Most studies were relatively easy to classify according to this typology, and we placed any studies which studied multiple activities in both categories. Many papers contained measures of two or three of the relevant activities, and when a single measure captured more than one, we included it in both categories. Ambiguous measures were rare, and when they emerged (e.g. [49]) they were labeled as including both activities.

The ES literature reflects significant agreement on a single construct of ES: recognition. The moment of noticing an ethical issue is a dominant part of ES studies. But both empirical studies and review articles add varying additional constructs to the scope of ES. Sparks & Hunt [92] debate whether ES should be limited to recognition alone or include an assessment of how participants assess the importance of an ethical issue. Shaub [84] includes the identification of alternative actions and their outcomes, the awareness of consequences, and the actor’s role in the situation. Jordan [55] notes that empathy and perspective taking may be worth including in ES. Weaver et al. [99] conducted a thematic analysis of the ES literature and identify eight attributes of ethical sensitivity. Concepts within recognition include affectivity, moral perception, and awakening. They also identify concepts beyond recognition in the literature to include particularizing, dividing loyalties, interpreting, justifying, and reflexivity.

To describe activities beyond recognition, we use Weaver et al.'s term "particularization" to describe activities that contribute to an individual or groups' understanding of the situation at hand once an ethical challenge is identified [99]. As we coded the empirical ES literature for particularization, we identified studies of both information seeking and individual and group reflection to belong to particularization. Information seeking included consulting professional standards [84], researching stakeholders and consequences [56], and eliciting the perspectives of others (whether team members or external stakeholders) [83]. Reflection included grappling with legal, social, or technical characteristics of the circumstance [99], considering the feelings and perspectives of others [83], and weighing personal attitudes and principles [65]. We were able to identify sixty-four papers in the corpus that included some aspect we identified as particularization.

While many conceptualizations of ethical sensitivity include only recognition (e.g. [84]), or recognition and some aspects of understanding [92] or particularization [99], others explicitly include judgment. Judgment was part of Rest's classic work on moral sensitivity [79], and Byrd [17] (p. 14) defines ES this way: "Ethical Sensitivity is theoretically defined as the ability for one to recognize a situation as an ethical dilemma and to choose the action that is considered appropriate". Because research focused on ethics in technology design is particularly interested in connecting the beliefs and practices of workers with the features of the technology they build, we believe it is useful to include judgment – which incorporates design decisions – in the scope of ES. However, because our literature review included only papers that used ethical sensitivity as a framework, we excluded a large body of papers studying judgment alone (e.g. those framed as studying ethical decision-making.) Of the 108 papers in the corpus, 40 included a measure of judgment and 8 measured only judgment. Future research on ethical sensitivity in technology design could incorporate the ethical decision-making literature to expand the options for operationalizing judgment.

4 METHODS FOR AND INDICATORS OF ETHICAL SENSITIVITY

Even with the many components of ES condensed into three umbrella concepts, our literature review revealed significant complexity in operationalization of those components: a common problem when studying unobservable theoretical constructs [52]. To operationalize and measure ES and its components, researchers must decide on a nested set of methods (what will be observed and how), stimuli (the situation(s) a participant will respond to), and cues (prompts for ethical reflection within the stimuli). Researchers must also decide upon indicators—observable properties of ES—and the analysis of those indicators. The relationships among these decisions are illustrated in Figure 3.

Analyzing the methods and indicators used in the ES literature revealed that methods for studying each component of ES— recognition, particularization, and judgment— are dominated by surveys in which participants were asked to respond to scenarios.

The indicators used to measure or represent ES varied significantly based on the component(s) of ES a researcher was studying. Research capturing recognition was dominated by survey responses in which the number of moral dilemmas respondents identified (primarily in vignettes) served as the primary indicator of ES. The indicators for studies of particularization were much more varied because of the complexity of understanding of a situated ethical issue. Studies of judgment were dominated by asking participants to evaluate the actions of others or suggest actions to be taken. We discuss methods and indicators for each stage of ES in more detail in the following sections.

Table 3. Recognition Indicators

Indicators	#	Examples
Naming moral dilemmas in a case	34	“Students were asked to list all the ethical issues related to the vignette they received. ... scored by one investigator as to the number of issues the student identified, regardless of the content of the response” [44]
Is x an ethical issue?	10	“Recognition of an ethical issue (REC) was evaluated with one item indicating the extent to which the scenario involved an ethical issue” [47]
Proxy or proxies assumed to relate to ES	9	Image slides were shown in pairs, some depicting moral situations and some not. They were later revisited with some new slides included. “If participants more often correctly identify the novel person with morally-relevant interaction pairs [of image slides], it suggests superior encoding of morally-relevant stimuli. The same is true for social interaction pairs. If there is no increased recall of morally-relevant interactions or social interaction, it suggests that the brain is not wired to give more attention to moral interaction over social or non-social people perception.” [71]
Brain scans	4	Participants were asked to look at images of in- and out-group members harming or interacting peacefully with each other (4 conditions). “Each scenario was followed by 6 items designed to assess the participants’ feelings of moral sensitivity toward the victim.” Brain images & answers were compared [68]
How quickly participant mentions ethical issues	4	ES score weighted by time: how soon in their response participants mentioned each issue [60].
Rating importance of given factors	3	Participants were asked to rank considerations in decision-making. ES indicator was how highly participants ranked items belonging to the ethical perspective compared to organizational, personal, and legal perspectives [102]
Thematic Coding	2	“The numbered transcripts ... were analyzed with inductive thematic analysis. After data immersion, two researchers respectively coded the transcripts to identify the main themes” including whether interviewees were sensitive to ethical issues in their job [49]
Self-report	2	The interview questions were the following: “Please explain your experience and perception of sensitivity in decision-making”; “How does your sensitivity affect your decision-making”; “Please explain what is meant by a manager’s sensitivity in decision-making and what it includes.” [82]

Fig. 3. Operationalization decisions in ES studies

Fig. 4. Recognition studies by method and stimulus

4.1 Recognition

Recognition is the triggering mechanism of the ethical decision-making process: the moment someone identifies an ethical issue in their work [104]¹. While executing the technical tasks of their job (helping a patient, reviewing tax documents, or training a machine learning model, for example), a worker may perceive a signal—called a cue—that the situation requires ethical judgment. Recognition describes a perspective shift from seeing the task as primarily technical to ethical [23].

Much of the ES research defines and operationalizes ethical sensitivity as recognition alone, perhaps because whether a person or group identifies a situation as having ethical import is a feature that distinguishes “sensitivity” constructs from other ethical behavior frameworks like

¹Recognition is sometimes called “awakening” or “perception”

Fig. 5. Particularization by Method and Stimulus

ethical decision-making [74, 95]. In our corpus, 56 papers focused on some aspect of recognition (51.9%). Figure 4 shows the methods and stimuli used to study recognition and Table 3 describes indicators of recognition in the corpus.

The ES literature revealed rather straightforward agreement on both methods and indicators for studying recognition. 64% of papers that measured recognition in our corpus used survey methods and employed scenarios as their stimuli: vignettes of varying length, usually presented in writing, but sometimes video or audio, usually tailored to the profession being targeted. Throughout the corpus, scenarios were most often employed in surveys (65.2%) but were also used in interview studies (19.6%), experiments (6.5%), experimental surveys (4.3%), as video prompts (2.2%), and qualitative studies (2.2%). Scenario responses were rated for a shared indicator: a count of how many ethical issues a participant recognized in the scenario. Alternative, less-frequent scenario approaches asked participants to indicate whether they believed issues or actions to be ethical or ranking factors (ethical and otherwise) used to make a decision.

After scenarios, a much smaller group of papers (21.4%) used less-detailed survey items which presented a general behavior without backstory (“a nurse gives a patient his daily medication” or “a teacher ignores evidence of cheating”). Respondents are asked whether the action has ethical implications, and the indicator is a count of how many scenarios involving ethics a respondent correctly identifies. Rarer modes of studying recognition included pairing images with memory tests [71] or brain imaging [81] and free reflection on work experience, in which thematic coding by researchers identifies ethical recognition [46].

4.2 Particularization

After workers are alerted to the presence of a potential ethical issue by cues, they begin to particularize: to assess the scope and magnitude of the problem; determine its relationship to their own responsibilities; and understand the options and resources available to address the issue. Particularization can be influenced by features of the situation (e.g., how much time and energy is available to process ethical cues), the cues (e.g., how many are available and how clear they are),

Table 4. Particularization Indicators

Indicators	# ²	Examples
Measuring theory-defined components of particularization	41	Used cognitive mapping to represent ES indicators mentioned by participants “in each of the four content domains (situational characteristics, issues, stakeholders, and consequences) and the linkages a subject makes between indicators” [56, 59, 60, 94]
Ranking or rating decision factors or ethical issues	10	Asked participants to rate the importance of each of several factors for each scenario: ‘confidentiality’, ‘recipient of benefit’, ‘independence’, ‘seriousness of breach’, ‘recipient of responsibility’, and ‘growth of firm’ [21].
Guided particularization	8	Walked participants in the treatment condition through an “Ethical Conflict Resolution Process” framework [66]
Evaluating thoroughness of response (range or depth)	7	In free responses to questions about a news clip, ethical sensitivity was measured by the range of different aspects of ethical sensitivity exhibited during the discussion (broader range taken to indicate higher sensitivity); and amount of thought, detail, sophistication (more depth taken to indicate higher sensitivity) [56, 59, 60, 94].
Labeling qualities of decisions	6	Likert questions in response to scenarios include: “Acceptable/Unacceptable” by tradition, family, people I admire, etc. “Efficient/inefficient,” “in the best interests of the company/not” [15, 76–78].
Listing factors used to make a decision	5	“Following [brain] scanning, participants completed an open-ended questionnaire in which they were asked to indicate what types of information and strategies they used in determining violation severity ratings.” [43]
What other information would you want?	1	“[Respondents] were asked to indicate the important. . .counseling aspects or issues related to the case, provide additional information they would like to know , and to suggest actions to be taken” [27] emphasis added.
Emergent codes	1	“The numbered transcripts . . . were analyzed with inductive thematic analysis. After data immersion, two researchers respectively coded the transcripts to identify the main themes” [49].

and characteristics of the individual or team (e.g., including personal values, individual reasoning, and social and embodied cognition) [99]. Workers also bring in external information during this stage, such as past experiences, the perspectives of other stakeholders, and external standards [99].

Sixty-four papers in our corpus studied particularization (59.3%). As was the case for recognition, surveys dominated the methods for studying particularization. When it came to indicators used

Fig. 6. Judgment by Method and Stimulus

to study particularization, papers were split between those that prompted respondents to focus on some forms of particularization (e.g., personal beliefs) and more naturalistic, reflection-based prompts. For example, the multidimensional ethics scale (MES), used in 4 papers in the corpus, guided respondents by asking whether an action taken in a scenario is acceptable or unacceptable to their family, tradition, or people they admire, emphasizing personal backgrounds [15, 76–78]. More open-ended particularization was prompted by reflection questions such as “What would you do to make yourself feel that you had done the right thing?” [26], asking participants what other information they would like to know in a situation [27], or asking participants to list any “issues,” “concerns,” or “aspects” of the case they’d use to make a decision. The Dental Ethical Sensitivity Test asked participants to carry on dialog from the scenarios as if they were in it, then asked why they responded this way, how they expected the patient to react, what issues in the situation are, what arguments could be made against their position, what the best interests of the patients are, what a dentist should do in this situation, and practically speaking, what they would do [8]. This series of questions was designed to “[require] the student to articulate the assumptions and perspectives underlying his or her response,” using participants’ identification of assumptions or perspectives as indicators of particularization [8], p. 227.

4.3 Judgment

After a worker has recognized and particularized an ethical situation in their work, they often go on to make a judgment. Rest’s foundational work discusses judgment in three phases: formulating the morally ideal course of action; deciding what one actually intends to do; and executing and implementing what one intends to do [80].

Unlike other review studies (i.e., [55]), we found that judgment was studied in the fewest papers in our corpus: just 40 (or 37%). This is likely because we scoped our literature search around ethical sensitivity-specific language and excluded papers that studied decision-making without making

Table 5. Judgment Indicators

Indicators	#	Examples
Evaluate actions of others or an action in general	27	"Respondents were asked to indicate their approval/disapproval of the action(s) of the Marketing Research Director in each item (scenario). A 5-point scale with descriptive anchors that ranged from "disapprove" (coded 1), "disapprove somewhat" (coded 2), "neither approve nor disapprove" (coded 3), "approve somewhat" (coded 4) to "approve" (coded 5) was used to elicit their evaluations" [3].
Suggest actions to be taken	11	"Practically speaking, what would you do?" [8, 70].
Choice of actions	6	"Subjects responded to a total of sixteen ethically sensitive situations of a personal or business nature. For each situation, subjects were asked to indicate their probable action on the issue on the five point scale of yes, probably yes, unsure, probably no, and no" [75].
Justification	2	"Participants were encouraged to articulate an argument and rationale describing whether they would support the use of [the therapy described in the scenario]" [83].
Assign a penalty	2	"... asked the participants' opinion regarding the penalty that they thought would be appropriate had there been a higher council that ruled the action in the vignette as unethical. Five potential penalties were presented in order of most severe alternative (i.e., the person engaged in the activity should be taken to court), to no penalty (i.e., there is no need for punishment). . . participants were asked to indicate their degree of agreement with each penalty suggestion using a seven-point Likert scale" [90].
Evaluate the character of others	1	Participants rated characters on "their perceived morality on a 9-point scale (1: very immoral character, 5: neither moral nor immoral, 9: very moral character) [62].

reference to the larger scope of ES³. Like recognition, judgment was studied most often through surveys, using scenarios as stimuli (45%). Indicators of judgment included participants' evaluations of the decisions of the characters in a scenario, participant's responses to whether they would perform a particular action, participants' opinions about what should be done, or participants' explanations what they would do if they were a particular character in the scenario (See: Table 5).

³Pederson conceptualized the relationship between ethical sensitivity and ethical decision-making, linking ethical sensitivity to problem formulation, the first step of some ethical decision-making frameworks [74]. He also argues that experience with ethical decision-making feeds back into the development of ethical sensitivity. So, these two concepts are quite related, and while we've separated them for expediency here, researchers interested in ethical judgment may be interested in the broader literature on ethical decision-making.

4.4 Studying all components of ES

Most studies in the corpus (62 papers, or 57.4%) focused on a single aspect of ethical sensitivity, studying either recognition, particularization, or judgment. Sixteen studies, however, focused on all three components (14.8%). Of the 16 papers that addressed recognition, particularization, and judgment, nearly all (14) used scenarios as the stimulus and used coding of participants' free responses as indicators of recognition, particularization, and judgment (12). Most of these responses were gathered via survey (9), with a handful gathered via interviews (3).

5 STUDYING ES IN SOCIAL COMPUTING

How might we draw on methods, indicators, and research experience in the existing ES literature to conceptualize new research in technology ethics? And what does the HCI and CSCW literature add to the study of ES? The ES literature benefits CSCW and HCI research by adding conceptual specificity, shared language, and tested indicators to studies of the ethical practices of technology designers. Explicitly observing recognition (what cues designers to notice potential ethical issues); particularization (what information sources, norms, stories, and beliefs they draw on to build their understanding of issues, options, and consequences); and how recognition and particularization shape design and policy decisions gives technology ethics researchers a shared set of constructs to observe, helping us design and present our research and compare findings across studies. Conceptual specificity and tested indicators will also improve the design and evaluation of the many ethical interventions developed by HCI and CSCW researchers. This section discusses how recognition, particularization and judgment can scaffold studies of, and interventions into, tech ethics work.

Simultaneously, HCI and CSCW researchers add creativity in methods and stimuli choices for studying ES in design work. Studies of ethics in technology design have employed more diverse methods, including ethnography, document analysis, and quasi-experimental methods to study dimensions missed by the current ES literature: in particular, the interactions of teams, and the situated and embodied nature of ethical sensitivity. In the following sections, we link the components of ES to existing HCI and CSCW research to illustrate how ES can benefit technology design research, and how technology design research can expand ES.

5.1 Studying ethical sensitivity in groups

Our first suggestion for adapting ethical sensitivity for social computing is to study ES as a social phenomenon. Currently, ethical sensitivity is conceptualized and operationalized as an individual trait. While studying ethical sensitivity among individuals may be useful in fields such as accounting or among populations such as students, technology design is frequently a team activity.

Studying ES among groups will enable researchers to observe how social and organization context influences recognition, particularization and judgment. For example, while an individual might recognize a privacy or fairness issue on their own, their communication of that issue to their team - and the team's response - will provide important evidence of how recognition works in groups. That communication can also illustrate how the group particularizes the problem (e.g. whether they seek advice or information from themselves or others, whether they express their personal beliefs or turn to professional norms for guidance, whether they dismiss the problem). Finally, the group will need to communicate about a decision, providing important evidence about group judgment.

Studying ethical sensitivity in groups also makes openings for new methods and richer data. Prior ES work is dominated by survey methods, generally within a single or small group of organizations. In Table 6, we compare the use of surveys with a common method for studying ethics in groups: trace ethnography. This comparison illustrates how the evidence of communication available

Table 6. Comparing an individual and group method

	Individual Method (Survey)	Group Method (Trace Ethnography)
Data	item responses, lists, free responses	browsing behavior, group interaction text (e.g. chat, email, forum posts), interview or questionnaire responses
Stimuli	survey items, scenarios, images	cues that arise as part of their work (e.g. writing a privacy policy [88])
Indicators of recognition	self-reports, “correct” answers, long or detailed free responses	key words or theory-defined indicators in messages reacting to real-world stimuli
Indicators of particularization	self-reports or theory-defined indicators in free response or self-reports survey responses	theory-defined behaviors (e.g. information-seeking) or indicators in messages
Indicators of judgments	self-reports in survey responses or free response questions	theory-defined indicators in messages (e.g. “we should,” “I am going to”), policy or design changes

in groups could capture recognition in reaction to real-world cues, contextual and cooperative particularization, and actual judgments, instead of self-reports on intent to act.

5.2 Recognition in technology design

Explicit attention to ethical recognition in technology design can help us iterate on and improve the many ethics interventions developed in the HCI and CSCW literature. Ethics interventions such as design workbooks and card sets function as cues for ethical recognition. Conceptualizing interventions as cues for recognition enables us to ask evaluative research questions such as: do some interventions increase ethical recognition more than others? The ES literature suggests indicators to quantify the impacts of interventions, such as asking participants to name the moral dilemmas they encountered after an intervention, asking if participants recognize particular ethical issues, or measuring how quickly participants can name ethical issues.

The ES literature can also scaffold HCI and CSCW literature that seeks to discover naturalistic cues for ethical reflection. For example, the framework of ethical sensitivity helps us see values levers [85–87] as one type of cue for ethical recognition, and ES can help discover additional cues. Building upon ES studies such as those conducted by Wittmer et al. [101, 102], which asked participants to engage in realistic managerial decision-making exercises, design researchers might ask participants to work through a design activity or reflect on their previous work experience to identify previously undiscovered workplace cues for ethical reflection [4, 46]. Using more established ES methods like surveys and scenarios can also facilitate new discovery in CSCW and HCI. Researchers might draw from the scales used in the Dental Ethical Sensitivity Test and Racial Ethical Sensitivity Test, which use open-ended questions to elicit recognition and understanding of specific ethical issues relevant to a professional context (dentistry and education, respectively) and have been evaluated for test-retest and inter-rater reliability [8, 10, 91]. Researchers can use a “funnel sequence interview” such as that developed by Lind and Rarick, using strategically ordered questions about ethical issues that progress from less to more direct [57]. The funnel sequence interview is used to obscure the purpose of the interview [57] and to give participants a chance to signal recognition of ethical issues before being prompted to do so [56]. The funnel sequence interview has been used in with news stories or scenarios as stimuli and analyzed using a cognitive mapping technique [59, 60] or a coding system [61].

CSCW and HCI studies of technology design can offer a richness of data and context that is missing from existing ES studies of recognition. Analyzing ethical recognition in secondary or historical data, for example, is a method that has been employed to study ethical reflection by HCI researchers but was not observed in the ES corpus. Email archives and online discussion forums can offer a view into individual and group moments of ethics discovery, including among workers distributed over time and distance [88]. Connecting contextual methods to the language of recognition and cues offers HCI and CSCW researchers a way to both define indicators for future comparative studies, and to connect moments of noticing (and factors that impact those moments) to design-critical next steps such as ethical particularization and judgment.

5.3 Particularization in technology design

Particularization is perhaps the richest opportunity for CSCW and HCI researchers to contribute data and methods to ethical sensitivity research, and to improve our understanding of design ethics by connecting existing work focused on noticing ethical issues to design and policy decision-making. Particularization during technology work is a complex phenomenon to study because it can be influenced by a host of both personal or group (e.g., education, experience, beliefs, communication, and practices) and situational factors (e.g., organizational context, strength of the cues, time available to process cues, pressures from other priorities). The ES literature has defined numerous ways of measuring components of particularization. Many of these are reflective, such as asking participants to list and rank the factors that went into a decision and evaluating the range and depth of those responses. These reflective techniques can help CSCW and HCI researchers add new concepts for observation, measurement and evaluation to studies of ethical practices in technology work.

Established features of particularization that could advance HCI and CSCW studies include assessing the priority of ethical issues among teams and leadership as in [84], listing factors influencing design decisions as in [16], evaluating designers' perception of stakeholder interests and conflicts as in [19, 58], surveying designers' acknowledgment of moral ambiguity as in [19], measuring designers' awareness of alternative courses of action available as in [19], assessing designers' understandings of how other actors might respond to alternative courses of action as in [10], studying designers' perceptions of consequences of courses of action as in [58], evaluating whether designers anticipate arguments against a course of action as in [10], and studying whether and when designers refer to external information sources as in [99].

Another particularization concept defined in the ES literature that could be useful to CSCW and HCI researchers is developing moral imagination as the skills useful to, and necessary for, particularization [54]. Imagination is required for empathy with other stakeholders, to search for relevant concepts and principles, and to consider all available options [22]. And while there is a broad range of work on improving moral imagination in computing (e.g. pedagogical techniques like case studies and role playing [32], studies of moral computing exemplars [50], and design fiction activities [30, 103]), these methods are rarely evaluated for their impacts on particularization. The ES literature suggests next steps for studies of moral imagination such as studying the effects of organizational socialization [92], job satisfaction [104], and other conditions of work on moral imagination, especially in teams. Ongoing research into particularization processes in technology ethics could improve not just research on technology work, but research on ethics pedagogy.

Social computing research can also contribute rich insight into the ways that situational factors impact particularization in technical practice. Although existing ES review papers describe particularization as a process of building understanding [9, 99], a majority of empirical papers in the ES corpus focused on capturing the post-hoc ways participants remember their ethical understanding. Social computing methods such as talk-aloud studies [25], trace ethnographies of ethical decisions [36], and ethnographic observation of values reflection among developers or users (e.g. [6, 48]) offer

opportunities to observe the complex interactions between personal and situational factors during the process of particularization. For example, Gray led students through a design process that asked students to generate an “elevator pitch” for their design concept [39]. He observed that students had difficulty with “ethical awareness” and was able to pinpoint challenges building empathy with users, which is a step that could be considered a component of particularization. In other work, Gray and Chivukula used on-site observations and follow-up interviews to observe ethical decision-making in the context of organizations [40]. They recorded work practices, speech acts, and non-verbal signals during the observation period, and documented participants’ reflections during the interviews. In fact, studying group work in particular may enable methodological innovation in the observation of particularization, because members of a team must explain and legitimate their decisions to one another, making particularization an explicit rather than a tacit process. Social computing research can fill a gap in ethical sensitivity research by focusing on teams and their in-situ ethical practices.

Finally, several aspects of particularization that are described in ES theory, but underexplored in the current ES literature, may be of particular interest to social computing. Interpretation, or contextual translation, is a particularization activity during which a worker reflects critically upon the influence of larger social systems by acknowledging their own assumptions or privilege and explicitly considering the perspectives of other internal and external stakeholders [99]. Numerous CSCW and HCI ethics interventions (e.g. envisioning cards) ask developers to reflect on the intersection of systemic factors and privilege in their work. Envisioning cards could be used to test how this form of particularization impacts teams’ design decisions. Dividing loyalties describes how workers resolve tensions among conflicting values and interests of multiple stakeholders [100]. In technology work, methods for grappling with divided loyalties have been formalized as stakeholder analysis techniques (e.g., values dams and flows [66]) in the value sensitive design literature [87]. Reframing these methods as an explicit part of ethical particularization again allows us to connect the impact of methods like values dams and flows to design decisions in real-world settings.

5.4 Judgment in technology design

Because social computing and design ethics is interested in connecting the process of perceiving ethical issues to design outcomes, studying judgment – and the relationship of judgment to design – is a final important component of ES for our field. Our literature review revealed that studying judgments is frequently easier to operationalize than recognition or particularization, both because people may recall their decisions with more precision, and because these decisions can often be seen in documentation (whether written policies or design decisions). The relative ease and importance of studying judgment extends to current work in technology ethics and social computing, as well. Research such as Fleischmann et al.’s work [32], which asks engineers to reflect on ethical decisions using both surveys and interviews, or the wide body of literature that examine technological objects for purposeful and implicit values within their design [72, 96], are examples of operationalizations of judgment in technology ethics research. Content analysis of design decisions, such as those by Shilton and Greene [88], or of user reactions to design decisions, such as that by Gray, Chivukula, and Lee [38], suggest document-based methods for studying judgment. And observational or ethnographic work focused on design decisions, such as those used by Chivukula et al. can trace the full path from stimuli to cues to recognition, particularization, and judgments [20]. We believe that explicit reference to the ES literature can improve and contextualize work focused on judgment by providing new research questions into the factors (cues, recognition, and the many components of particularization) that impact judgments. ES gives us concrete language to ask: what factors impact ethical design decisions?

Finally, contextually-aware methods already in use in HCI and CSCW may also be able to answer new research questions about judgment’s role in ethical sensitivity. Do people follow

Rest's three-part judgment formula in real work settings (formulating the morally ideal course of action, selecting their intention, and executing their decision) [80]? Can a judgment or its consequences prompt recognition of a new ethical problem? Does previous judgment acting as a cue for recognition a new ethical problem change the features of the discussion of that new ethical problem?

5.5 Studying ethical sensitivity as an aspiration

While we have largely discussed ethical sensitivity as a descriptive framework for studying technology work, the construct also has normative potential. For example, existing research suggests that ethical sensitivity can be learned through both professional education and socialization within a field [98]. However, there is no consistent ethics curriculum among computer science departments [29], nor do all developers receive a computer science degree [2]. Although developers can belong to a professional organization with a code of conduct (e.g., Association for Computing Machinery or the Institute of Electrical and Electronics Engineers), membership is not required to practice. Professions with strict occupational closure require their workers to complete educational programs and maintain credentials, which offer a way to consistently discuss ideas, disseminate best practices, and enforce rules. Software development instead relies on individual workers to notice ethical issues and determine what to do and firms to train and enforce norms.

Reframing ethical sensitivity as a normative goal enables us to think through indicators for evaluating computer ethics education and the impact of professional ethics efforts. We imagine that ES and reflexivity about ES can be an ongoing part of design. Explicit goals of computer education might be increasing recognition of workplace ethical cues, or increasing the forms and modes of particularization students to which students are exposed. Best practices, training exercises, and interventions can be designed to prompt recognition, guide particularization, and support judgment. Educators, trainers, and professional organizations can encourage awareness of ethical sensitivity, and support related activities (like information-seeking and making judgments) by offering targeted resources such as particularization guides or dedicated time reserved for building and implementing mitigations.

Similarly, Weaver & Morse suggest that ethical sensitivity can fail to develop (e.g. workers miss cues, or do not engage in particularization and judgment) if workers either are overly certain about the right thing to do in a given situation, or if they address situations as solely technical [100]. Previous studies of ethics in software development suggest these situations may be common in development work. For example, Shilton has studied how important technical values like interoperability are frequently translated as values neutrality, interfering with ethical reflection during design [86]. Cech has found that engineering students' engagement with questions of social welfare issues declines over the course of their college education [18]. To counter these tendencies, Lurie & Mark have proposed a form of software development that explicitly interweaves ethical frameworks into technical decisions to address a perceived separation of technical work from stand-alone codes of ethics [64]. The IEEE Standards Association has proposed P7000, a process for ensuring ethical concerns are addressed during system design [1]. Building explicit reference to recognition, particularization, and judgment into ethical design frameworks could help the field form shared vocabulary around the steps that ethical reflection requires.

Finally, we can also, like Heggstad et al., use ethical sensitivity to reflect on our own research practices [45]. Considering how HCI and CSCW researchers recognize ethical issues in their work, particularize those issues with their own beliefs, the practices of their colleagues, and reference to external guidance ranging from ethics review boards to professional code of ethics, and then make judgments about ethical research practices, could further the fields' growing interest in the ethics of its own research practices [11–13, 28, 69, 97, 105].

6 CONCLUSION

This paper is the result of two HCI researchers discovering, analyzing, and ultimately critiquing the literature on professional ethical sensitivity. Boyd was seeking a theoretical framework to guide her investigations of when and how machine learning engineers consider and address issues of bias in their work. Her discovery of a broad ethical sensitivity literature was exciting: it provided both conceptual foci (where to look) and suggested methods (how to look) for ethics in practice. Shilton recognized components of her previous work within the ES framework. She realized she had long been studying a component of ES - recognition of ethical issues in technical work, and the cues that trigger that recognition - without naming it as such. And she recognized that other HCI scholars had been studying another component of ES - judgment - in the form of design decisions. We were inspired to systematically review the ES literature to understand how scholars outside of social computing have used these terms, and how they have observed or measured these constructs. This paper traces our journey through the Ethical Sensitivity literature. We remain excited for the concrete and well-justified framework - the what to study - that ethical sensitivity provides to studies of design workplaces and social computing. But we found less than we'd hoped for in guidance of how to study phenomena such as ethical recognition, particularization, and judgment in ways that take into account cooperative work and situated and embodied practices. The survey methods that dominate the current ES literature is quite different than the methods that dominate CSCW and HCI ethics research, which tends to observe participants' situated ethical sensitivity by studying teams [41], by observing real-life work situations [89], or by providing real-world stimuli [103].

Despite the gulf between the constructs measured in the ES literature and those observed and interpreted in CSCW and HCI, our analysis does suggest ways that a broad range of researchers interested in ethical sensitivity in technology work can structure their research. First, our analysis distills from the literature three concepts particularly useful for studying cooperative design work: a team's recognition of ethical issues, particularization of those issues through both internal reflection and external information seeking, and judgment through actions, policy, or design decisions. A wide variety of indicators have been developed and used in the current ES literature, particularly for recognition (which usually involves counting or classifying the ethical issues named by participants) and judgment (which focus on action, either counting the actions recommended by participants or asking participants to evaluate the actions of others). Adapting these for studies of groupwork during technology design might include counting the first mentions of ethical issues among development teams, classifying the judgments and justifications offered by group members in meetings or Slack channels, and asking participants to connect the options and reasons they considered to the actions they executed.

The technology studies literature is increasingly focused on changing the conditions of technology work [42, 67], recognizing that even the most ethical individuals cannot create change unless the entire sociotechnical system allows for that change. ES is a useful framework for understanding ethics in work practice and workplaces, but significant new empirical research is needed to define the factors most important to particularization within tech workplaces, alongside the stimuli and cues that are most effective for recognition of ethical issues, and how these two components interact to result in ethical judgments, policy, and design decisions. The authors still struggle to operationalize these fuzzy social constructs in our own work. But narrowing our goals from studying "ethics" to studying recognition, particularization, and judgment gives us useful signposts to apply our own embedded, observational methods. We hope other CSCW researchers will find similar clarity and utility in the ES literature.

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