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Infrastructure in Crisis: A Values-Driven Framework for Transparent Contextual Decision-Making in Emergency Situations

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Abstract

Techno-solutionism in crisis management often conflicts with user privacy concerns. The technology industry frequently applies user expectations in an ad hoc manner, such as after a scandal or legal repercussions. Users have technology and tools thrust upon them with little or no choice as they attend school, go to work, and participate in society. This is compounded with a sense of urgency where privacy is an after-thought in design. This paper proposes a values-driven framework to guide implementors to identify core values that connect to the technical functionality. It also prompts decision-makers and implementors to transparently define the lifecycle of data as it traverses their technology by describing the stages that users will encounter. This framework aims to bring higher level ideas and values directly into the decision-making process as it situates and connects human values within the data lifecycle to functionality within the technology.

1. Introduction

Crisis situations require rapid development and implementation of technology infrastructure to address disaster situations using data [1]. Institutions, governments, and companies increasingly rely on cutting edge technology solutions for communication and information mechanisms, including information collection, dissemination, and data management in crisis situations. Quick, controlled responses in a disaster impact not only those experiencing the disaster, but also global perceptions, economies, and cultures [2].

Thoughtful policy and regulation are repeatedly sacrificed in the face of disaster or crisis to collect as much data as possible to help those in need. These situations reach across local contexts, technology sectors, and have various time frames requiring context-aware support [3]. Building and implementing functionality in operation for an unknown amount of time, for a hastily defined purpose, and for an unclear volume and demographic of users also means that the data collected, analyzed, and stored is vulnerable to both context collapse and time pressure, not to mention accountability concerns. Implemented infrastructure lacks definition and clarity, obscuring core privacy principles that extend to the data, such as fairness, transparency, choice, and data ownership [4].

While ignoring privacy and other data governance principles is not unique, it creates particularly exploitative scenarios in a crisis, as time and (frequently) choice is extremely limited [5]. Urgent and sometimes ongoing crises collapse key factors in developing fair, private, and human-centered data governance, transmission, and ownership, creating a breach in user trust. Hogan and Shepherd (2015) state that

> "Privacy is not about resisting exposure so much as it is about an inherent human right to not have to justify one's need for freedom..." (p. 16)

This highlights the tension users feel as they navigate technology use [6]. Power in the hands of users evaporates and those making decisions exert control through technology enabled infrastructure [7].

Technology that is used or repurposed to aid in crisis, whether it be a natural disaster, a public health crisis, or a political/social struggle, is driven by values held by those providing the technology. Crisis as motivation to share or sell data on apps and platforms is driven through fear and a desperation to connect, direct, and coordinate others as shown by refugee crisis situations [8]. However, with no clear end to the crisis and/or no clear regulations, data derived from these systems remains in the hands of technology and those controlling it, without transparency for those impacted. It may even continue to be collected after a crisis ends once it is in place or installed on users' devices [9].

Data governance frameworks, recommendations, and initiatives grapple with technology solutions from all sorts of entities, including private companies,

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governments, and in almost every sector area, such as healthcare, education, and the workforce. The types of data produced by these efforts are just as varied, from traditional demographic information to biometric data, to metadata, to data generated from the 'raw data' collected [10]. Governance reflects these diverse challenges with solutions designed to help users take back their data and redistribute power. Data commons, data trusts, risk assessments, and other work all bring the battle to the level of the data, typically within private business [11], which unfortunately is often already collected, stored, and sold by the time users are aware. Current institutional infrastructures support this cycle: it is easy and legal for data to be collected, scraped, and generated at any time from any piece of technology without the user's knowledge [6]. Storage exists in the elusive cloud, where users do not have access or control [12]. Transparency efforts have sought to break down the black boxes technology operates within [13], but it still remains generally obscured behind functionality and by practice and norms, as large companies claim to be the only ones capable of handling this data [14]. Stopping information wrongdoings and security threats before they occur, whether directly or indirectly [15], requires reshuffling the process with which we understand, adopt, and implement technology. This is the gap that this paper hopes to address.

As demonstrated by the COVID-19 pandemic, technology quickly found new footholds in activities and situations that were previously in person or under prioritized. Overnight, software tools such as Zoom became lifelines to connection, education, and work [16] particularly in the classroom. Facial recognition technology from social media found its way into proctoring software [17], and both examples demonstrate how tools and dataset are re-purposed [18]. Education was digitized and platforms sold and share data with third parties [5] without transparency or recourse. Function and scope creep occurs gradually, and accelerates in moments of crisis without usual safeguards. Human ramifications of enacted technology that disregards users' needs can lead to compromises in safety and vulnerability [19]. Development is an important ground to investigate in a crisis, but so is the extension of technology.

2. Background

Everyday technology and platforms regularly forgo user privacy in favor of various other priorities, including security, accuracy, and functionality [9]. Such trade-offs are framed as positive outcomes for the end user, even when those trade-offs run counter to user expectations [20]. Further complicating the problem is the data sharing that occurs between companies, institutions, and other entities. Data collected through one technology is often shared with third parties, creating untraceable data flow through invisible hands [9]. Additionally, with data flow, context is lost, and data is transformed through each new situation and purpose [21]. In crisis or disaster situations, those trade-offs can be amplified and further exploited. Whether it be a natural disaster, a public health emergency, or a political conflict, time is nonexistent [18]. It is imperative that technology immediately help facilitate actions to help those in need. Thoughtful, careful integration of privacy or other policies can be pushed aside in the name of urgency. A cycle that does not include privacy or other more abstract user concerns pushes those notions even further from innovation. It is not that those concerns do not matter, it is that they do not matter right now.

Examples of this trade-off abound. A prime example, which has received an abundance of news attention, is the use automated proctoring software. A key feature of this technology is facial detection and recondition, which is aimed at monitoring students as they write a test remotely. Shea Swauger outlines in the MIT Technology Review how an ongoing pandemic has created a novel situation where biometric technology such as facial recognition and eye tracking have been repurposed and combined for education and proctoring purposes without seemingly any thought to privacy or student choice [22]. During the pandemic, students are taking tests remotely and this software requires students to be recorded in their homes, to be accessed any time by the teacher. This has created a myriad of problems, from misreading students' mannerisms and test taking habits as fraudulent, to a general feeling of invasion of privacy into a user's home or personal space.

Consider a student who is enrolled in class before pandemic measures came into effect. This student would go from in person communication, test taking, and peer interaction to message board and chat exchanges and Zoom break rooms to engage in the class. The Zoom class is being recorded and saved, and the teacher has asked all students to turn their cameras on. Additionally, if an automated proctoring software is used for testing taking, students' location is also captured, in addition to being recorded. Perhaps this student has roommates, family, or has to take the class from their car to access a better internet connection. The Zoom class is displaying, recording, and storing these details for everyone on the call and who watches the recording. This can be embarrassing, invasive, and records anyone who may be in the background of this student's environment, causing networked privacy concerns for roommates or family members. Beyond putting students' personal space on display, these invasive practices disproportionately affect low income students, who are less likely to have access to a computer, internet, and space to do virtual school work [23]. The implementation of this tool, which was supposed to help students pursuing education remotely during COVID-19, highlights what can go wrong when technology is thrust onto users with little thought to their lived experience with the technology.

A second example of ”leaky” technology use is the gathering and indefinite storage of location data collected by emergency applications designed to help users get aid in a natural disaster, which sometimes is shared with third parties [9]. This issue was featured in the news when it was reported that FEMA shared personal and financial data of 2.3 million disaster survivors with a contractor [24]. These examples show how the rise of technology use has brought a set of trade-offs between user privacy and technology functionality across multiple platforms and industries. During a crisis, the trade-offs are more uneven, making it difficult for timely, careful development decisions and users have little choice but to give up their privacy.

This framework borrows strongly from the spirit of Agile, where rapid development, flexibility, and iteration are key components, and testing or outcomes are prioritized. Instead of (or along with) designing tests and writing code for that test, the current framework proposes identifying values and matching functionality, followed by writing code for those values. No matter time or contextual constraint, any technology must be examined and tested before being deployed to ensure it meets functionality needs. A popular software development practice called Test-Driven Development (TDD) is often used to develop software that places testing before development [25]. In this practice, tests are formulated and created before any code is written, and the program is designed to evaluate the code using the pre-written tests. Throughout development, tests continually fail until the code meets the testing requirements. The framework presented in this paper adopts the TDD workflow and underlying concept of defining desired outcomes before deciding how that outcome will manifest. Test-Driven Development is heavily used in Agile software development practices [26] that are aimed at modularizing code and development, minimizing overhead and administration, and implementing feedback. Agile and other computer science paradigms have been applied as a workflow methodology beyond software development as a fast, efficient way to approach work, ideas, and project management [27, 28]. This allows values to steer the direction of development or re-purposing of technology. Mapping values to functionality grounds values in the functionality of technology, and integrates values into the development or selection workflow. This also separates the technology system from the data, which can be a sticky process, and inserts values in between the two [29]. The current framework also takes TDD a step further and aims to make decision-makers aware of both the values they want to act on and the context a technology will be deployed within, recognizing context as a key piece of data governance work [30]. While TDD and Agile inspired this framework, the framework is independent from those practices and is for developing or making decisions about technology at any level. Decision-makers do not have to know or use TDD or Agile to use the proposed framework.

3. A Values-Driven Framework

This paper attempts to address what has become a habitual trade-off between user privacy and rights with technology functioning, data accuracy, and security. The role of values in decision-making and design has become a topic of interest in business, economics [31] and supply chain governance [32], particularly when it comes to digitization and data transfer. Values-centered approaches have also emerged in engineering disciplines, where mathematical modeling is used to maximize economic value to achieve the best possible design, in contrast to setting the tool requirements as a sufficient design goal [33]. Lee and Paredis (2014) bring the critical questions of ”whose values, and which values” to economic value optimization frameworks and describe a normative approach where the designer centers their own preferences and values in the design and decision making process [34].

Value Sensitive Design (VSD), a proactive, iterative, and principled technology design approach, explores the intersection of values, design, and information systems [35]. Like Agile programming, this paper's framework builds on VSD features by applying some of its functions into new crisis and education related contexts. Unlike VSD, the framework poses concrete questions intended to guide the decision-makers through a process of values identification and application upon a new technology design or for an existing, already designed system and iterates with the developers or creators of the technology as they progress through the cycle of creating, testing, and deploying an application. Throughout the remainder of the paper, those providing a tool, technology, or technology service either as an individual, a group, or on behalf of an institution will be referred to as implementors, as they make decisions related to technology that will impact the end users. For example, an implementor could be a developer writing code for a mobile application, a company that is a selling a data related service, or an administration procuring a piece of technology for a university. Who the implementors or decision makers are is highly contextual and may change over time. The word ”implementor” was chosen carefully to convey that a decision maker may not have the ability to directly change or control a tool’s functionality, or be the original author, but is assuming responsibility for its impact in the context it is deployed.

Values are a central part of decision-making, and Katie Shilton [36] narrates the long history of values, ethics, and decision making in human computer interaction and characterizes the web of bias, ethics, design, and technology impact as a wicked and contextualized problem. Shilton’s [37] ethnographic investigation of the impact of socially driven values on design, called value levers, also serves as a foundation for this work. This paper proposes a descriptive data governance framework, in contrast to normative frameworks. It aims to outline common emergency and non-emergency development pitfalls and suggest iterative actions that can be taken to minimize user expectations and needs with a focus on values.

3.1. Why a Framework?

Concerns grow around the role of data, tooling, and the obligations of institutions that generate, store, and share that data. Michael Madison’s [38] work on the tension between open knowledge generation and sharing, and proprietary data-driven activities at universities highlights the need for adjusted data governance frameworks. Previous work on the data commons and privacy [39, 40] further discusses gaps and conflicts in data governance, current practices, and human expectations for transparency, trust, and privacy. In particular, these authors demonstrate how anonymous data and data sharing practices are possible and imperative. Previous governance frameworks have focused on mapping legal policy to areas of other technology infrastructure, such as IT infrastructure [41]. Building from this line of inquiry, organizational values can also be mapped to the data transmission as a way to ensure that user rights and values are reflected at each stage of data movement, allowing for detailed and contextualized decision-making [42]. This also allows organizations to identify the expected progression of data as it lives in a piece of technology, which can be non-transparent in a crisis situation. Developing or implementing technology requires several rounds of writing, reviewing, testing, and discussion even in the most time-sensitive of situations. The values-driven framework progresses along with development. At each stage, this framework proposes using the identified developer, administrator, or institutional values as a lens to query user experiences with technology and the transmission of data, as demonstrated in Figure 1.

Operationalizing values identification and impact is recurrently demonstrated in the healthcare field’s implementation of technology and development of policy [43], as well as in improving traditional forms of nursing care [44]. This framework approaches shortfalls in data privacy as a trade-off that is rooted in a difference in values and priorities between the end user and the organization behind the technology [9]. The focus is placed on identifying core organizational values and integrating those values into decision-making throughout the data and development lifecycle, both before and during that cycle. Functionality often drives development, deployment, and re-purposing of technology, and the values-driven framework aims to disrupt that pattern by framing values as an intentional mechanism that shapes and guides functionality choices.

Consider again the student who had to switch from in-person, pre-pandemic classroom dynamics to an all virtual, Zoom-based setup. Schools and universities tried to recreate classrooms digitally by replacing the physical classroom with video calls with technology such as Zoom and activities like test taking with proctoring software. However, the features that come with these tools are applied without consideration for student-specific contexts. Imagine if the value ’consent’ was identified as an important goal or ’test’. Implementors can evaluate a technology, say Zoom, with consent being part of the criteria. They can walk through how data may flow from the student, to Zoom, and beyond and connect consent to features and flows. Understandably, replacing the physical classroom with digital alternatives happened quickly. By building the values process into the development cycle, time, which is an evolving concept in design, becomes less of a development pressure point.

Certain activities must occur when building or considering new technology. Combining values with functionality is a way to operationalize what lives in documentation and policy, considering them in parallel instead of after the fact. It is also designed to help unintentional breaches in user trust or experience, where conflicting values or incentives may go unnoticed. In a crisis where time is short or where traditional activities like meeting in a physical classroom must be re-imagined, having functioning values offers a way to take into consideration higher-level notions while codifying function.

Taking this one step further, the framework helps implementors to identify those values, maps them to user expectations of privacy, and demonstrates how to integrate those mapped principles to the data/development lifecycle. To begin, the people behind the development or deployment of technology must reflect, separately from the technology, what is important to them and their organization so that it can then be mapped to user privacy concerns and expectations. They can work with a solo implementor, a team of people, or multiple groups. Defining roles and decision areas is key to developing a strong data governance plan [45], just as identifying what data and functionality will be needed in an application are key to successful and sustainable technology use and adoption. Using this framework, implementors will consider their values before addressing those concerns to build a foundation that will guide those decisions. The framework consists of two sets of questions and an exercise: one set of questions to identify values, one to identify the specific context that this technology will operate within, and then an activity to connect values with privacy concerns within the context.

3.2. Applying the Framework

Inspired by Uustal's work on values clarification in nursing [44] and Friedman and colleagues' [35] work on VSD, the following questions are a possible set of queries to prompt implementors to consider values, once those involved in the technology decision-making are identified. Implementors of a technology will be unique to each situation - for example, in an education setting, the implementors may be an IT department who have chosen a learning platform or a teacher who decides that the class should learn a specific program. The act of introducing (or creating) a tool into a context with users determines who should work to identify their values.

1. What, if any, legislation or laws at the federal and state level must be followed when implementing this technology?

2. If a privacy or governance policy is in place for you, what values are stated in that document? Why those values?

3. What three adjectives would you use to describe you/your team/your organization? Why those three adjectives?

4. When making professional decisions, name three principles that guide your/your team/your organization's decisions? Why those principles?

5. Think of an application or technology service you use regularly. As a user, what is valuable to you? How do you want your data to be handled?

Answering these questions and discussing the answers helps to build a narrative. It creates causal flow between what is occurring during decision-making and why those values are the drivers behind the decisions, which manifest in the technology developed, selected, or repurposed for a group of users [44]. Identifying what happens internally in a system will also help to integrate feedback from the system, users, or external factors [42]. Creating a narrative involves contextualizing decisions, which is frequently missed or a hard-to-reach goal in development. This also bridges technological priorities and human impact on users. The human narrative and context identified at the beginning can reach and include the human user impact at the end of the data lifecycle.

The second set of questions addresses what context the technology considered or in development will operate within and can be completed alongside practical questions about features, cost, and resources. Understanding the different contexts that users and technology will interact within helps to create a larger picture that the identified values can become part of. This set of questions contains suggestions meant to help implementors scope out the context. The most important question to answer is the definition of the data lifecycle. Answering this critical question is about identifying data and where it is generated, transformed, transmitted, and made vulnerable. Previous research has shown how legal frameworks can be operationalized through data lifecycles [46] to couple policy and technology. A data lifecycle does not have to be linear, although it certainly can be. The start and end points may be ambiguous or multiple, or many branches of activities may occur. The idea is to create a general flow of data and features that handle that data at each stage. Using an isolated instance, single context, or activity is a great place to start. For example, in Figure 1, a student using an online education tool for a single course provides a specific lifecycle. This could be made broader to include the student's entire time at an institution as well.

1. Who will use this technology? Where and when are they using it?

2. When will users start to use this technology, and when will they stop (if ever)?

3. What context does your work operate in? What are common issues across all contexts? What are some unique challenges that occur?

4. Keeping the start and end situations in mind, describe the data lifecycle. What stages will the data travel through as users interact with the technology?

Answers to those questions can be mapped to common data privacy concerns, including transparency, consent/choice, and openness within a data cycle of a technology product. This creates a connection between implementors working on decision-making mechanisms in a crisis. Integrating values into functionality in a timely manner involves asking these questions ahead of time, and mapping answers to privacy concerns at each stage in the data lifecycle. The process of values identification can occur anytime, independent of any crisis or particular cycle of development. This process can also be revisited and refined over time. By aligning professional values with user concerns as the data transforms throughout the stages of use, implementors can ensure functionality and data practices aligh with values.

Once values and a data lifecycle have been established, the third stage can be completed, which is linking values and privacy concerns throughout the lifecycle. The privacy concerns and principles include openness, transparency, and consent [47]. While these are abstract, linking them to specific stages and then to features in technology can shape the concrete manifestations that are developed. At each defined stage of the lifecycle, these values should be revisited to ensure that they remain cognizant in the minds of implementors throughout the process. Figure 1's workflow can be applied to the example of a student transitioning to a digital classroom using Zoom.

The second and third parts of framework are designed to be applied during or after a crisis occurs, because implementors cannot know the context or functionality needed until the crisis happens. However, the initial step of identifying and reflecting values can take time and can be done separately from a crisis situation, perhaps on a regular basis. Time required depends on the number of implementors and technical complexity, but can be completed in a day under emergency circumstances or addressed over time. With values already identified, implementors can start on the second set of questions when the need occurs. It is important that this step is first, but it does not need to be done immediately before the second step.

Implementors can assess students' experiences and data flows by examining the context. They can connect values to functionality by examining the data lifecycle related to specific features. Implementors may realize there are no features to help students enforce values like privacy or transparency and can take steps to find solutions. Using Zoom as an example, implemetors may realize the data from Zoom is passed to third parties without students' knowledge or consent. Default features, such as warnings that a session is being recorded or having the option to turn a camera off may align with the values and 'pass' the values test. This student can attend class without fear of exposing that they had to sit in a parking lot to get internet access. They can also be aware that what they post, talk about, and share will live in multiple places. This also relieves the student from having to wonder or inquire about the impact of the tools they are using, and shifts that labor to the implementor.

Automated proctoring software provides a second example within the educational context that also highlights the importance of understanding values, functionality and context. Proctoring tools often use machine learning to automate how students are monitored and flagged for possible cheating behavior. In this case, the tool is not just facilitating but actively making decisions that directly effect students. The decision to flag a certain behavior is based on training data that favors "normal" test-taking mannerisms. This begs the question of what is normal test taking behavior? Facial recognition, eye tracking, and recording functionality are used to enforce the values of the implementors and the machine. We can imagine a student taking a test at home where their children are also present, or a student who needs special accommodations, and see how can proctor functionality can struggle in those contexts.

Functionality is where values and privacy principles can meet and, ideally, harmonize. This harmonization can be realized in the form of design requirements, where values and lifecycle events can inform what data functions should be developed or included. Choosing data functions that align with identified values is key to delivering a technology that builds trust and user expectations. As data functions control what data is collected, managed, or transformed, requirements governed by values will ensure data is handled in accordance with higher, abstract principles that live beyond current technology development. At each stage throughout the lifecycle, values and functionality are re-examined and linked to actual technology functions, as depicted in Figure 1.

3.3. Framework Evaluation

Similar to Friedman's VSD framework [35], this framework is also iterative and cyclical. The framework has been described in a linear fashion above, but the process can and should be repeated. The

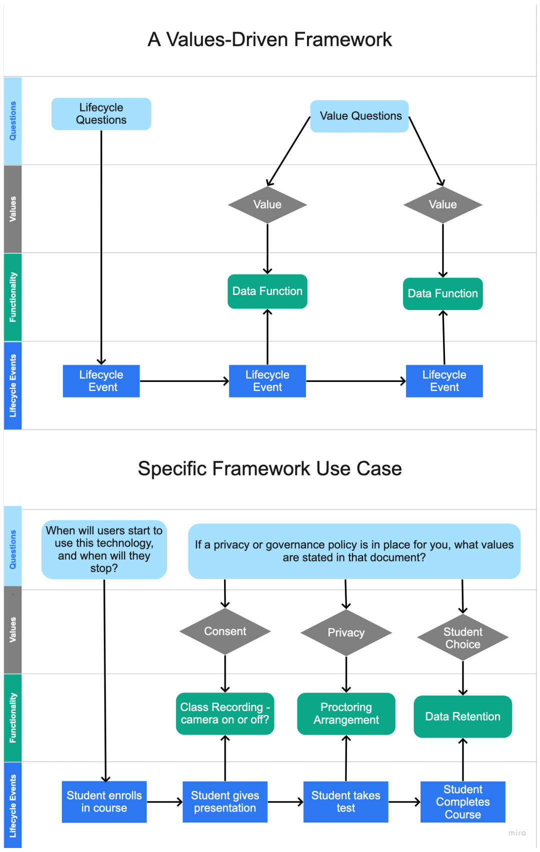

Figure 1. The framework reflects a process, beginning with questions about the values of those developing the tool and about the envisioned data lifecycle users will experience. Lifecycle events correspond with tool functions, which are also contextualized by transparently specified values. The goal of the framework is to identify both gaps and friction between human values and machine functions.

student experience in a digital classroom case study demonstrates an initial, linear walk-through of the process, but revisiting the values identification, values and functionality linkage, and data lifecycle steps is imperative to account for changing technology functions, user needs, or values realignment. In fact, evaluating the efficacy of this framework in real world scenarios requires revisiting the answers to the set of questions above. Returning to the idea of TDD, where a test is first designed and the program is developed to pass the test, evaluation in this case works the same way. The values, principles, or policies identified as driving priorities function as the 'tests' or evaluation criteria. Previous work in the measurement and evaluation discipline states that picking a few indicators for evaluation is best [48].

In some cases, that may be straightforward. For example, if financial concerns were prioritized, costs can indicate if the project passed its test or met its goal. Other values may be harder to measure or quantify. How can ideas or abstractions be used to evaluate the framework? Here the technological functionality can be used to determine if a value was implemented. Is functionality that aligns with a value presented, in whatever form the project design called for, in the technology implementation? If transparency was a high priority value, are there features that match that sentiment, such as user warnings, easy-to-read privacy policies, or options for users to understand where and how data is used? Are those features present throughout the data lifecycle? This builds cyclical evaluation into the system, similar to other frameworks [48].

In contrast with development of new features, challenges focused on bringing together or re-purposing existing platforms can focus on identification and discussion in evaluation [49]. For example, if a technology like Zoom is being repurposed for education use, understanding and mapping the flow, storage, and current features to identified values alignment is worthwhile.

Value conflicts and trade-offs are discussed in Friedman's VSD and others inspired by it. Conflict resolution in this framework borrows from network governance and stakeholder evaluation to help understand designer and implementor priorities, highlighting the positions of all designers involved and to address disagreements [49]. For example, a values conflict may arise when re-purposing Zoom for the classroom. Values such as privacy and collaboration may conflict with features such as meeting recordings and storage. It may be important for a designer to provide access to recorded student lectures, and important for a different designer to limit access to recordings, localize data, or not record student lectures at all. The use of proctoring software exemplifies a particularly difficult value conflict between concerns of academic integrity from an institutional prospective, potentially differing values from instructors who administer the software, and well-founded fears about being incorrectly flagged or failing the test from students, not to mention the privacy concerns. In these cases, discussing a few points further may help elucidate why a designer is taking their position (is it school policy? Have students or teachers requested this feature?), how much of a priority it is, in what functionalities the value appears (are there other privacy concerns, such as default features?), and in what context this value applies (does recording a Zoom meeting outside of the classroom change this situation?). In this way, conflicts can be examined from multiple positions and in relation to the technology.

Outside of an emergency situation, getting user feedback would be an ideal way to evaluate the framework's success. Incorporating user feedback is an important feature of the Agile development framework, and if time allows it can refine the development process as it occurs. This framework is suited for development in both emergency and non-emergency contexts, as the values identification portion can be done at any time and the functionality design and data lifecycle mapping can be done as the technology is being implemented.

Additionally, this framework is scalable; it fits all organization types and sizes, projects with various scopes, and across the data lifecycle. Crisis brings variability to any context, and adjusting the framework to meet evolving needs is critical. The impact of contingencies can be mitigated by changes to the organizational structure performing the work [50]. The second set of questions aimed at understanding the data lifecycle and context of a crisis can help identify changing variables and allow implementors to adjust. For example, classroom sizes, student accessibility needs, and instructor technical literacy all may vary greatly for virtual classrooms and may need to be addressed. Defining human values and context and intertwining them throughout the decision process, whatever level or type of technology is being considered, is key to breaking down the black box paradigm and moving away from what works to what should work for each context. This framework is highly contextualized and is not a one-size-fits-all solution.

Applications of this framework will look different in each use and context. The framework suits the data lifecycle perspective, but it could also be applied to the code development perspective or to a suite of technology tools. It can be scaled up to look at data moving between software platforms, with each stage a transition to a new platform. It can be scaled down to a single implementor creating a tool from scratch, where the lifecycle is defined as the code is written. The framework of identifying professional values, defining the cycle and nature of information movement and transformation, and mapping values to common privacy concerns at each stage of the identified cycle is relevant to anyone aiming to connect abstract policy with practical technology functionality.

This framework has three key parts: defining organizational or personal values, understanding a technology's functionality, and describing the nuanced ways that data and its impact work in a certain context. Instead of having open-ended lifecycles and workflows, this work hopes to bring intention and purpose to technology and governance work in a timely, thoughtful, and human-centered manner.

4. Challenges and Opportunities

The values-driven framework, while designed to reduce time invested in ad hoc privacy measures and efforts, still requires time up front from implementors who must identify values and define the data lifecycle. In a crisis scenario, this is less than ideal and could still be seen as an unnecessary step in a time crunch. Motivation to integrate higher order values and principles into technology development, use, and implementation remains a key part of the adoption and use of this framework. Up-front investment in defining values and principles can be a one-time or rare activity, and once the first set of questions is complete, they can be reused across technologies and contexts. Like test-driven and Agile software development, this framework depends highly on user feedback so the development process can centered user needs. Because of time and logistical constraints, actual user feedback is not possible through this framework, at least in terms of the initial decision-making. User feedback provided after the implementation should be considered and thus implemented where possible, but is not reflected in this work. This framework centers on common core values shared by the implementor team instead of constant user input.

This framework is most applicable to situations where technology is being developed or deployed for people, particularly when there is little choice to opt out. This includes education platforms, government tools or websites, or any technology that is aimed for a human population that does not have the power to choose otherwise.

5. Conclusion

Operationalizing privacy and policy work is a key challenge in technology development and one reason for the prevalence of ad hoc privacy approaches. The framework presented in this paper creates common ground between both higher-level values and technical implementation and is a novel approach to fair, transparent, and human-centered technology experiences. Usage of the framework will vary across organizations and crises, and it can be fitted to any development or administrative decision-making task. Fostering an intentional, human-focused culture and approach to technology development and adoption is the key aim for this work. This framework is divided into three parts: defining organization or personal values, understanding the local and varied contexts that users will face through this technology, and mapping the values and contexts to actual functionality in the technology. Through this mapping, contradictions and gaps may be identified, addressed, and brought into line with the existing values and policies of an organization. This framework is designed to address black box and long-standing privacy failures by grounding implementors and decision-makers, increasing awareness, and changing decision-making and development cycles, without unduly slowing it down. Integration of values identification and functionality testing helps to support this aim. The need for rapid technology development and deployment is becoming increasingly necessary and common, and human-centered needs of privacy, transparency, and fairness cannot be left behind in urgency.

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