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Ethics-by-Design Canvas: a Visual Inquiry Tool to Reduce Ethical Blindness in Digital Innovation Projects

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Completed Research Paper

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Abstract

Digital innovation can generate significant ethical risks, such as privacy breaches, digital addiction, or algorithmic biases. To reduce these risks, academics argue that digital innovations should focus on human well-being and flourishing rather than functionality or efficiency. However, even with these concepts in mind, the complex and often ill-structured nature of ethical risks makes it challenging for designers to identify them, a phenomenon known as ethical blindness, and develop effective mitigation strategies. To address this challenge, we introduce the Ethics-by-Design Canvas (EDC), a visual inquiry tool designed to promote ethical reflection early in the design process. By proactively identifying ethical risks, the EDC helps designers incorporate mitigation strategies from the outset, reducing the likelihood of ethical costs arising post-launch. Our evaluation results (N=26) suggest that the EDC is usable and effective in reducing ethical blindness and identifying mitigation strategies for ethical risks.

Keywords: Digital Ethics, Visual Inquiry Tool, Ethical Blindness, Digital Innovations.

Introduction

"I'm sorry for everything you've all gone through" apologized Mark Zuckerberg to parents at an online child safety hearing held by the U.S. Senate in January 2024 (Yang, 2024). On the one hand, this apology exemplifies the *Build first, ask for forgiveness later* mindset typical of Silicon Valley's rapid innovation culture at any cost (Singer, 2018). On the other hand, it also indicates that digital innovation is under greater scrutiny as society calls for more transparency, fairness, and integrity. More broadly, whether it is concerns about privacy breaches or the biases embedded in Artificial Intelligence, the call for ethical standards is pressing. Europe responded with recent legislation such as the General Data Protection Regulation (GDPR)[1] and the Artificial Intelligence Act[2], ensuring greater protection of personal data and guidelines for the development of Artificial Intelligence (AI) tools. Yet, these regulations often lag behind the fast pace of innovation, leaving a gap between technological progress and ethical reflection (Barbosa et al., 2021). While large corporations operating in a high-pressure environment, such as Facebook, may be difficult to influence, these regulatory and societal changes also impact smaller organizations that can more readily integrate ethical considerations into their development processes (Brozović et al., 2025).

Ensuring that such values are upheld is at the core of the concept of *"digital ethics"* which can be defined *"as integrating digital technology and human values in such a way that digital technology advances human values, rather than doing damage to them"* (Kantar and Bynum, 2021). Many reports advocate placing the promotion of *"human flourishing"* as the overarching principle for the development of digital innovations, (i.e. IEEE, 2017; The Royal Society & The British Academy, 2017). Concretely, in the context of social media platforms, digital ethics is not only focusing on ways that connect users for some positive outcome, or reduce a pain point for users in their networking, but on the potential implications of innovations for human flourishing, including with respect to social comparison, or addiction.

Consideration of human flourishing as an aim brings focus onto the soft or indirect impacts innovations may have, in both the shorter and longer term. Failure to consider these issues in the design and use of technologies can result in an *"ethical debt"* - harms built into the ways systems operate (Petrozzino, 2021). Therefore, designers should integrate ethical reflection early in their design to potentially change course before harm is done. However, even with these concepts in mind, identifying ethical risks and appropriate mitigation strategies can still be challenging. One of the main reasons is the fact that understanding ethical issues of a particular context is a complex, ill-structured problem (Barbosa et al., 2021), which results in designers, without ill intent, lacking awareness of a decision's ethical dimension. Such lack of moral awareness is referred to as *"ethical blindness"* (Palazzo et al., 2012).

Ethical blindness is an inability to recognize the ethical dimensions of a decision, often due to lack of knowledge, cognitive biases, organizational pressures, or a focus on immediate goals. This problem is exacerbated by the time pressures common in many digital innovation projects (Palazzo et al., 2012). Palazzo et al. (2012) argued that ethical blindness can be reduced through *moral imagination*, which involves imagining potential consequences and alternative actions within given situations. Conversely, unaddressed ethical blindness during system design can increase a system's ethical debt. This challenge is particularly salient to early-stage startup innovators, which are still adjusting the fit of their value proposition. This group is important as early-stage startups emerge at a rate of over 130'000 every day worldwide (Microsoft News Center, 2022) reaching 150 million in 2025 (DemandSage, 2024). In this paper, we specifically focus on these early-stage innovations.

A potential solution to reduce ethical blindness is to support the collaboration of diverse teams, as they can promote flexible framing and encourage disagreement within teams (Edmondson and Harvey, 2018; Palazzo et al., 2012). Facilitating collaboration and discussion in diverse teams requires specific tools, particularly to address sensitive ethics questions. One promising approach is the use of visual inquiry tools, which provide structured frameworks for collaborative problem-solving and decision-making (Avdiji

[1] https://gdpr.eu/

[2] https://artificialintelligenceact.eu/

et al., 2020). A visual inquiry tool can be defined as "*a visual management tool in the format of a canvas*" (Roschnik and Missonier, 2023). This is illustrated in various Agile design methods, where team members initially align their ideas *on paper* before market exposure (Osterwalder et al., 2015). Examples of such tools include the customer journey map (Rosenbaum et al., 2017), the value proposition canvas (Osterwalder et al., 2015), the team alignment map, or the business model canvas (Osterwalder and Pigneur, 2010). While some preliminary work has begun exploring how ethical considerations could be framed within visual inquiry tools (Cardia et al., 2017; Hardebolle et al., 2023), this previous research has not yet formalized such a tool, empirically validated its benefits as a support for designing digital innovation, nor assessed its impact on reducing ethical blindness.

This paper precisely addresses these open issues, by exploring the *reflection process, creation and evaluation* of a visual inquiry tool that facilitates the identification and mitigation of ethical risks during the design phase of a digital innovation project. We contribute to the field of Information Systems by introducing a visual inquiry tool to address ethical blindness in digital innovation projects, with ethical reflection to promote human flourishing in digital innovation. We also provide preliminary empirical evidence of its effectiveness and insights on integrating ethical considerations early in the design process to mitigate potential negative impacts of new technologies.

Research Approach

We followed a user-centered design approach (Abras et al. 2004), integrating design thinking and design science research (DSRM) (Bason and Austin 2019), ensuring both practical relevance and theoretical rigor. The global project involved a multidisciplinary team of specialists in information systems, ethics, design, and computer engineering, along with industry partners. The initial ideas of the canvas to guide digital innovation started from our previous work on humanitarian technologies (Cardia et al., 2017) with the goal to align digital innovation with humanitarian principles. This work evolved to support the design of technology-enhanced learning experiences (Hardebolle et al., 2022) and then to support engineers to assess digital solutions (Hardebolle et al., 2023). The research presented in this paper builds on those previous outputs. Over a year, we conducted several design iterations with user feedback from multiple workshops. More specifically, we organized four workshops, each lasting 60-90 minutes, targeting various stakeholders. The initial workshop gathered approximately 40 specialists in engineering ethics education. This was followed by three additional workshops with students: one in an engineering ethics course, another in an information systems course for business students, and a third in a machine learning course for computer science students, with attendance numbers of 30, 100, and 500 participants, respectively. This paper focuses on the final iteration designed based on the feedback of these workshops and is structured according to Avdiji et al.'s three-step framework for designing and validating visual inquiry tools: (1) framing the problem, (2) creating a shared visualization, and (3) instantiating and evaluating the visualization (Avdiji et al. 2018). Our methodology combines practice and theory in guiding the artifact's design (steps 1 & 2). For the evaluation (step 3), we employed both quantitative (surveys and concept mapping) and qualitative methods (feedback and workshop observations).

Related Work

This section begins with ethical considerations in digital innovation, with a discussion on how digital innovations can support human-flourishing. We then explore the concept of ethical blindness. Finally, we review visual inquiry tools and their application to ethical issues.

Digital Innovations to Support Human-flourishing

The question of how digital innovations can, and should, support human well-being and flourishing is a topic among academics. Scholars argue that digital ethics must go beyond harm reduction and focus on a human-centered approach (Desmet and Pohlmeyer, 2013; Mittelstadt, 2017). For this, incorporating an interdisciplinary ethical perspective during the innovation process is needed, which requires guidelines (Burr et al., 2020; Terán et al., 2021). Some methodologies emphasize the importance of including human values in the design process, for example, Value Sensitive Design (VSD) or User-Centered Design (Osterwalder et al., 2015). However, as Reijers and Gordijn (2019) argue, such methodologies can be criticized for their tendency to conceptualize values as user preferences or needs, rather than as

foundational ethical principles. This limits their ability to provide a strong ethical foundation for action, and makes it harder to account for the tensions that often arise in design decisions (Knight et al., 2023; Reijers and Gordijn, 2019).

In their work, Burr et al. emphasize that digital innovations must account for both individual and societal factors that shape well-being. To do so, they advocate embedding ethical reflection into the design process from the start, encouraging designers to consider moral and cognitive dimensions of user experience, not just functionality or efficiency (Burr et al., 2020). They argue that adopting an interdisciplinary perspective is needed and recognize the risk of using a fixed ethical framework, as it will be ill-equipped to deal with novel demands and will quickly become *"unfit-for-purpose"*. Markendahl et al. (2017) propose a reflective equilibrium between ethical theories, and an iterative process through ethical thinking while designing digital innovation. Calvo and Peters (2014) also argue that digital ethics requires input from a wide range of disciplines and should not focus on a single perspective. For them, adopting different *"ethical lenses"*, perspectives to analyze and evaluate ethical issues, is needed to optimize ethical reflection, and an iterative process through them can enhance the outcome.

Moreover, in their recent literature review, Terán et al. (2021) review 256 articles on digital ethics concepts and note the lack of comprehensive frameworks or guidelines to address ethical issues from a more philosophical standpoint, specifically focusing on humanistic values. They emphasize the need for solutions that are not only technologically sound but also ethically grounded, and advocate for comprehensive approaches that better integrate ethical considerations into the development of digital innovations. Their work also highlights twelve ethical concerns from interdisciplinary ethical perspectives: *autonomy, discrimination, domination, exclusion, exploitation, inequality, justice, privacy, responsibility, trust, dignity, and truth*, as well as the need for sustainable perspectives (Terán et al., 2021).

Ethical Blindness and Visual Inquiry Tools

The concept of ethical blindness, introduced by Palazzo et al. (2012), refers to the temporary inability of decision-makers to see the ethical dimension of a decision at stake. This blindness reflects a deficit in the moral imagination, the capacity to consider imagined possibilities both in terms of what impacts might arise from an innovation, and what ethical actions one might take in design processes. In the context of technology development, this phenomenon can lead to the creation of products or services that inadvertently cause harm or violate ethical principles. Hagendorff et al. (2020) apply this concept to AI ethics, arguing that developers often suffer from ethical blindness due to the complexity of AI systems and the pressure to innovate quickly. Similarly, Treviño et al. (2014) discuss how organizational cultures in tech companies can contribute to ethical blindness by prioritizing innovation and growth over ethical considerations. In their work, Palazzo et al. (2012) argue that rigid framing contributes to ethical blindness. To reduce ethical blindness, they emphasize the importance of flexible framing and diverse perspectives. This involves challenging mindless routines, fostering moral imagination, and encouraging disagreement within teams (Brief et al., 2014). While previous efforts have worked on solutions to develop ethical reflection (Hardebolle et al., 2022; Reijers et al., 2018), to the best of our knowledge, none of these have provided a formal design approach nor have aimed to specifically address the challenge of overcoming ethical blindness.

Visual Inquiry Tools in Design Processes

Visual inquiry tools have gained popularity in design processes for their ability to facilitate collaborative problem-solving and decision-making. The Business Model Canvas (Osterwalder and Pigneur, 2010) is a prime example, widely used in entrepreneurship and innovation contexts. Recently, research efforts have been made to investigate how visual inquiry tools can support reflecting on ethical issues during digital innovation processes. In an early effort, Cardia et al. (2017) focused on designing humanitarian software that adheres to humanitarian principles. They created a canvas guiding humanitarian agencies toward a principled approach to information and communication technologies. They included four ethical risks associated with humanitarian principles (humanity, neutrality, impartiality, and independence) and space to integrate mitigation strategies (Cardia et al., 2017).

Further, Reijers et al. suggested integrating ethical guidelines into the nine-box structure of the Business Model Canvas (Osterwalder and Pigneur, 2010), helping researchers to engage with the ethical impacts of their research and innovation activities. Examples of these newly labeled boxes include behavior, relations, worldviews, group conflicts, and groups affected (Reijers et al., 2018). The idea was further operationalized through ethicscanvas.org, a web-based platform designed to support practitioners and designers in conducting ethical reflection. This canvas mainly investigates the context of the solution and general negative impacts rather than providing guides to reflect on specific ethical issues. This research also measured perceived usefulness and found positive reactions among participants. Furthermore, Franzke et al. (2021) created a visual framework to support collaborative discussions about data-related ethical risks. Their Data Ethics Decision Aid (DEDA) promotes discussion by exploring 12 data-specific ethical dimensions. Empirical evaluation showed effectiveness in increasing data ethics knowledge across all measured categories, with users showing significant improvements in "remembering" and "evaluating" ethical concepts (Franzke et al., 2021). Additionally, Gillet et al. (2022) suggested using the Value Proposition Canvas with alternative questions for sustainability-related projects and projects related to AI explainability. Typically guiding questions include thinking about customers and jobs-to-be-done as beneficiaries and their aspirations, or thinking about black-box effects as pains for AI design (Gillet et al., 2022). This work also found positive usability through a canvas evaluation. Finally, Hardebolle et al. (2023) developed a visual canvas to help engineers identify ethical risks in digital tools. Their canvas includes five main ethical risks (non-maleficence, privacy, fairness, sustainability, and empowerment) as well as a beneficence box to put risks in perspective with benefits. A usability survey was conducted, and it was found that the canvas was perceived as useful and practical (Hardebolle et al., 2023). Other innovative ideas include, for example, Plot4AI, which gamifies AI risk assessment through a 138-card deck. While the tool has gained recognition from major institutions, such as the European Data Protection Board, its effectiveness validation relies primarily on community feedback rather than empirical studies (Ortega-Bolaños et al., 2024).

These studies provide valuable insights into ethical reflection and the ethical impacts of digital tools, providing a foundation for our work. However, they do not address the specific issue we aim to tackle. Indeed, some of these efforts are either too focused on specific areas, such as humanitarian principles (Cardia et al., 2017), sustainability (Gillet et al., 2022), data and AI (Franzke et al., 2021); are not based on an underpinning theoretical ethics framework (Gillet et al. 2022; Reijers et al. 2018); are not specific to digital ethics issues (Reijers et al., 2018), or do not provide an empirical co-design user study (Cardia et al., 2017; Hardebolle et al., 2023; Ortega-Bolaños et al., 2024).

Ethical Blindness and Digital Innovation: An Ontology

Following Avdiji et al.'s three-step framework, we begin (Step 1) by building an ontology, i.e., *"an explicit specification of a shared abstract, simplified view of the world one wishes to represent for a purpose"* (Gruber, 1993) to frame the ill-structured problem we aim to address; ethical blindness in digital innovation projects. For this, we followed Design Principles (DP) for conceptual models (Avdiji et al., 2020), which include *frame* (DP1.1), *rigor and relevance* (DP1.2), and *parsimony* (DP1.3).

Context: Ethical Blindness

As illustrated in Figure 1, we frame the context of our conceptual model in a particular type of innovation process, namely agile user-centered innovation processes, where designers begin by defining the *problem* before designing a fitting *solution* (DP1.1). A context is typically associated with benefits and ethical risks. However, when designing a solution that fits a particular problem, designers mostly focus on bringing benefits to end users, but less on the *ethical risks* associated with it (Osterwalder and Pigneur, 2010). As we argued above, one of the reasons is that these risks are often complex and difficult to see, obscured by *ethical blindness* (Palazzo et al., 2012).

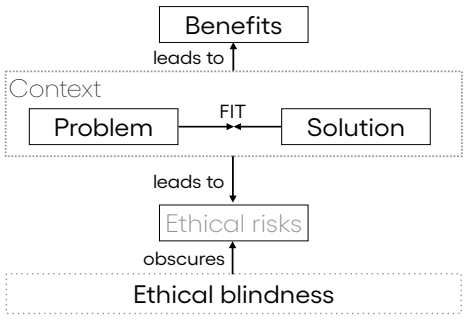

Figure 1. Simplified Ontology

Risks and Ethical Lenses

In this paper, the risks are typically second or third order effect, i.e., effects that are the results of other effects. In terms of future scenarios, the ethical risks addressed in this work are typically in the category of predictive *what if* scenarios, that evaluate what can happen under certain circumstances in a relatively short and confined setting, without including external developments that would be included in broader *explorative scenarios* (Börjeson et al., 2006). One of the issues is that, ethical risks being obscured, it is often difficult to identify them without guidance. Adopting *ethical lenses* can shed light on these risks by offering guidelines for reflection and a starting point for moral imagination (Markendahl et al., 2017; Palazzo et al., 2012). Based on the twelve philosophical ethical concerns identified by Terán et al.'s literature review, and insights from existing digital ethics frameworks, we selected five key ethical lenses to guide our work: *Welfare, Fairness, Autonomy, Privacy,* and *Sustainability*. These ethical lenses were selected based on their foundation in multiple established ethical theories and their relevance to digital innovation (Gal et al., 2020; Hovorka and Mueller, 2024; Scott and Orlikowski, 2022).

Welfare draws from utilitarian principles and virtue ethics (Gal et al., 2020), focusing on the well-being of all stakeholders. It asks if the solution was designed with the user's well-being in mind (Loi et al., 2020) and if there are potential unintended harmful consequences for both users and broader stakeholders. It embodies the core principle of *"do no harm"*.

Fairness is rooted in theories of justice (Sandel, 2011), addressing equity and inclusivity. It asks if the solution is accessible to its users and if it contains potential biases. It highlights disparities and discriminatory practices against individuals or groups (Ballantyne, 2018).

Autonomy stems from deontological ethics, emphasizing individuals' rights to make informed decisions. It asks if the solution empowers users and if they can make informed choices regarding its usage (Howe III and Elenberg, 2020; Jobin et al., 2019; Loi et al., 2020).

Privacy aligns with rights-based approaches and contemporary data ethics discussions. It asks about the scope of data collection and the risk of unintended disclosure of private information (Howe III and Elenberg 2020; Jobin et al. 2019).

Sustainability reflects environmental and social ethics, considering the long-term impacts of digital technologies (Brennan and Lo, 2002). It asks about the solution's resource consumption and the implications for human labor (Ryan and Stahl, 2020).

These lenses also incorporate other important ethical dimensions. For example, the *Fairness* lens inherently addresses equity and inclusivity, while *Autonomy* encompasses aspects of transparency in decision-making. Finally, the importance of each risk can be assessed by its associated *probability* and *impact*. Recognizing the rapidly evolving nature of digital transformation (Scott and Orlikowski, 2022), we've included a sixth, open-ended lens (represented as *"…"* in our Figure 2) to encourage users to incorporate additional ethical considerations.

This approach allows for speculative foresight (Hovorka and Mueller, 2024), helping to anticipate and address emerging ethical challenges as technologies and societal norms evolve (Burr et al., 2020). It also preserves and enhances moral imagination.

Mitigation Strategies

An important aspect of risk assessment involves understanding the actions that can address them, the *mitigation strategies* they are calling for. These mitigations influence the design and functionality of the digital innovation, primarily affecting the solution. Consequently, the reshaping of the proposed solution modifies the context, subsequently influencing its associated risks. The iterative process proposed facilitates the refinement of the solution and mitigations (Steen, 2013). Figure 2 illustrates the full ontology, which focuses on the main building blocks presented above (DP1.3).

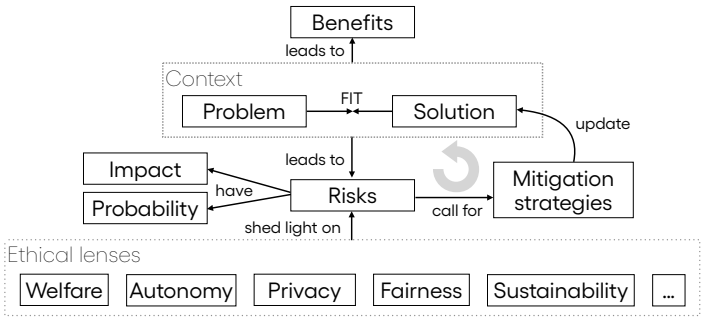

Figure 2. Ontology of Ethical Blindness in Digital Innovation Projects

The Ethics-by-Design Canvas: A Shared Visualization

We continue (Step 2) by representing the ontology described above in a shared visualization, the Ethics-by-Design Canvas, depicted in Figure 3. To do this, we followed design principles for shared visualization, which include *functionality* (DP2.1), *arrangement* (DP2.2) and *facilitation* (DP2.3) as well as those for direction of use, such as *ideation* (DP3.1), *prototyping* (DP3.2) and *presentation* (DP3.3) (Avdiji et al., 2020).

The canvas header outlines the problem, solution, and expected benefits, which remain relatively static and are derived from earlier stages in the innovation process, such as the Value Proposition Canvas. Its focus is to support group brainstorming around ethical issues, using ethical lenses to ideate potential mitigation strategies. Earlier iterations of the canvas displayed these items more prominently. However, they were not seen as necessary and used up a significant portion of the canvas space, which could better be used for its main focus: ethical lenses. As such the five ethical lenses presented above are central to the canvas (*Welfare, Fairness, Autonomy, Privacy*, and *Sustainability*) and include sufficient space for adding Post-it (DP2.1). Earlier iterations of the canvas used similar lenses, but we refined the naming of several lenses to better clarify their meaning to participants, such as *Non-maleficence*, which became *Welfare*, and *Empowerment*, which became *Autonomy*. It should also be noted that we kept a set of questions that we developed in earlier versions of the canvas for each lens to clarify their function and help users brainstorm.

Each lens includes sections for *risks* and corresponding *mitigations* placed side by side to emphasize that an ethical risk is not a fatality and can potentially be mitigated through an adequate design strategy (DP2.2). The use of Post-it allows for dynamic co-design sessions where ideas can be added, (re)moved, or modified (DP2.3). Small bomb and clock icons are depicted as metaphors for the impact (from small to large) and the probability (from rare to often) of a risk. Furthermore, an icon representing the effectiveness of a mitigation strategy is also included. These icons allow users to better understand the importance of risk and prioritize mitigation strategies (DP3.2). Earlier iterations of the canvas did not include these aspects. We added them since they were aspects that we ended up discussing systematically with users of the canvas and that we thus deemed important to include. The result serves as a starting point for subsequent design iterations (DP3.3).

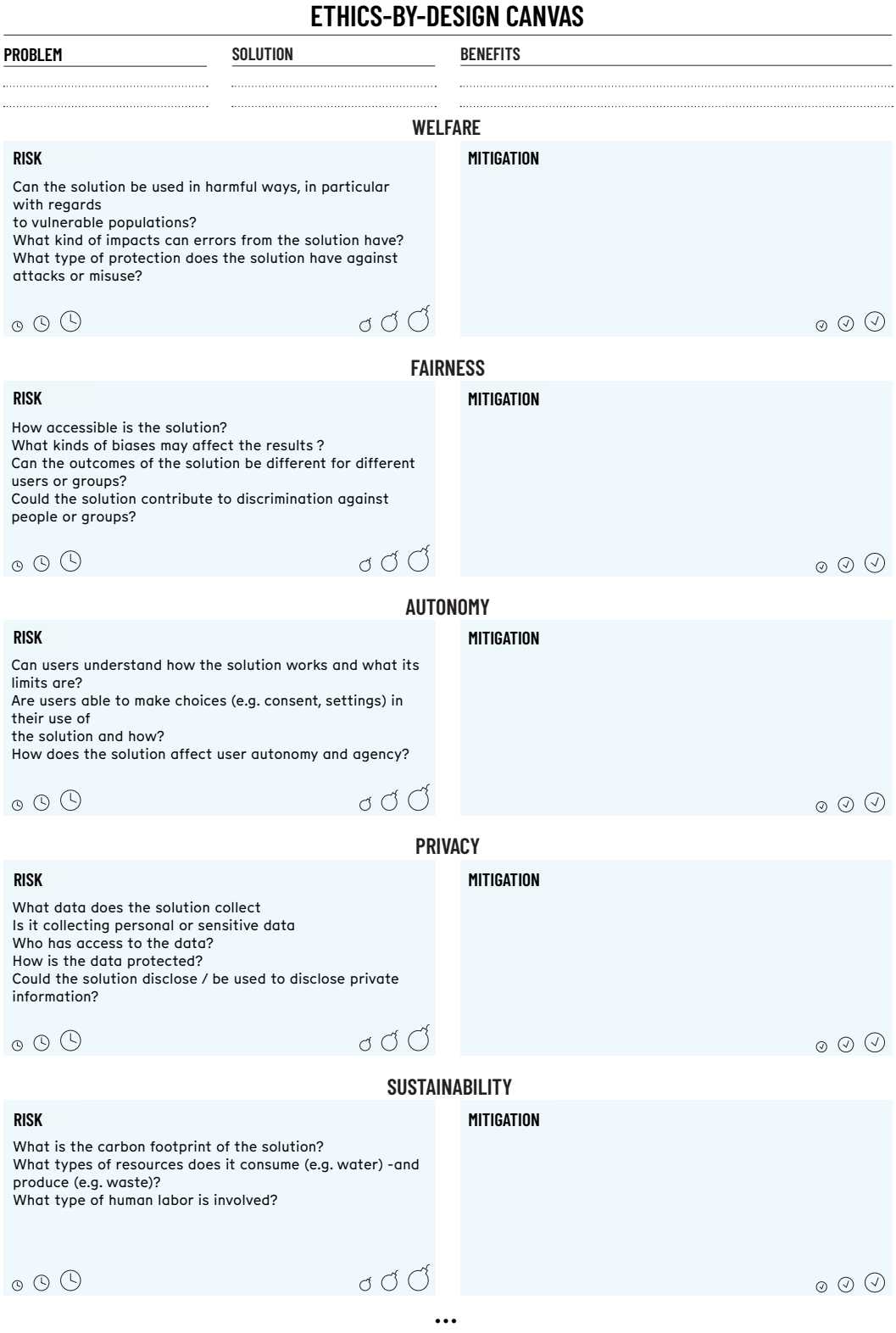

Figure 3. The Ethics-by-Design Canvas

Canvas Use Case

To illustrate the canvas's usage, we consider a use case where we want to design a digital classroom interaction tool aimed at promoting active student participation. The target user profile is a student in a classroom seeking engagement with instructors. Student hesitancy to participate may stem from fear of judgment or lack of confidence. Desired benefits include enhanced learning outcomes, potentially achievable through an anonymous classroom interaction app (Govaerts et al., 2018).

Welfare asks if the solution can be used in harmful ways. Including anonymity in digital tools can unintentionally lead to a sense of impunity, which may negatively affect user welfare. There is a risk that users abuse this anonymity to make offensive remarks about others. The impact of this risk depends on the context (e.g., higher for teenagers than adults). Mitigation strategies range from introducing usage etiquette allowing users to report abusive messages or adding a moderation feature.

Fairness assesses the solution for accessibility or potential biases. Issues may arise with message anonymity, potentially favoring certain demographic groups over others. For example, research suggests that anonymous messaging tends to be associated with male authors, possibly making female contributions less prominent (Shane-Simpson and Gillespie-Lynch, 2017). This highlights a potential tension between features of a solution that can increase some risks while mitigating others.

Autonomy focuses on users' understanding of the system's functionality and limitations. Simple classroom interaction systems, where messages are displayed chronologically, are generally easy for users to comprehend and pose minimal autonomy risks.

Privacy concerns center on data collection practices. To mitigate risks, the system should adopt privacy-by-design approaches, minimizing data collection and potentially using temporary content storage. These approaches not only protect privacy but may also encourage participation, as temporary content has been shown to increase user engagement (Lehrer et al., 2023).

Sustainability focuses on the environmental impact of the classroom interaction apps. These distributed applications require network access and server coordination, potentially necessitating hardware upgrades. A mitigation strategy involves designing for minimal device requirements, which not only reduces environmental impact but also improves accessibility.

After gathering and analyzing all the ethics-related ideas on the canvas, we can revise the solution to fit the context and then evaluate the resulting benefits. This shows the interconnectedness of ethical issues, demonstrating that mitigating one risk can create another.

Co-Design Workshop with the Canvas: An Instantiation

Finally (Step 3), we instantiate the visualization into a shared support and test it in a co-design workshop, during a prototyping phase of 10-week-long for digital innovation projects. The digital innovation projects were part of a semester-long Master course on information systems design (6 ECTS) for 32 students (9 Male, 23 Female), enrolled in a general management program. Consent to participate in the workshops was provided by 26 of the students. Non-consenting students fully participated in the workshops without data collection, ensuring no negative impact on their course experience. The research and teaching teams operated independently, with the teaching team being unaware of individual consent status. This study received approval from the University of Neuchâtel Ethics Commission. The innovation projects covered the last 10 weeks of the course. Students had to work in groups of 3 (11 groups) to design and evaluate a prototype of a digital innovation built to address a previously identified problem in the context of a sustainable development goal (SDG). Students were guided to follow a design thinking approach going through the standard empathize, define, ideate, prototype, and test phases.

EDC Introduction Session

Before the project started (Week 0), we introduced the EDC to students during a 4-hour lecture on ethical issues related to the design of information systems. In this lecture, the EDC was presented and a hands-on activity with students was conducted. During this activity, students acted as innovation users.

EDC Workshop Session

On Week 4 of the project (during the prototyping phase), we created a 2-hour learning activity where students used the EDC as innovation designers rather than users. In this activity, students were asked to start with the Value Proposition Canvas (VPC) they had built up to that point. The VPC allowed them to define the context, expected benefits, and prototype of the solution. The activity started with students working in their own groups to fill out the EDC for both risks and mitigations. Then, we conducted two rounds of a jigsaw activity, where participants from other groups gave feedback and new ideas to each group. At the end, groups reconvened, and students were asked to reflect once more on the solution they would adopt for their digital innovation. The activity ended with a debriefing session on the EDC.

EDC Evaluation

We explored the use and perceptions of the EDC through a pilot study, designed to test three dimensions of the EDC: usability, observed use, and ethical sensitivity. These are informed by the evaluation settings proposed by Avdiji et al., which we adapted to our exploratory educational context (Avdiji et al., 2020).

Usability. To evaluate the canvas in terms of usability, we asked participants to fill out the AttrakDiff questionnaire (Hassenzahl, 2003) at the end of the EDC introduction session. The questionnaire concluded with an open-ended question inviting participants to provide comments or suggestions on the EDC.

Observed use. To understand how participants used the canvas in practice, we observed their interactions with it during the workshop session (Week 4). Throughout the workshop, two researchers observed the participants and took notes based on observation guidelines, focusing on participants' behavior, canvas placement, conversation types, and time spent on each section of the canvas. Additionally, photos of the canvas were taken at each step of the workshop. The risks, mitigations, and value propositions for each group were then summarized in a document. At the end of the activity, the debriefing session was recorded. The qualitative analysis from the debrief session was conducted by two independent researchers. The process was as follows: (1) both researchers independently reviewed the transcripts and notes from the debrief session, (2) each researcher identified key themes and insights emerging from the data, and (3) the final analysis represents a synthesis of both researchers' interpretations.

Ethical sensitivity. We measure reduced ethical blindness as the increase in ethical sensitivity, the ability to recognize and respond to ethical issues. To do so, we asked participants to elaborate on concept maps, answering the question *"What are the ethical risks associated with Information Systems?"* and including examples of such risks. We compared participants' responses at the beginning (Week 0) and at the end of the project (Week 10). We evaluated the quality of the concept maps based on Bartels' Scoring Rubric for Concept Maps (Bartels, 1995), with a maximum score of 8. Of these, 6 points were allocated to the quality of the response, specifically, the range of ethical risk types identified, and the relevance of the examples provided, and 2 points to the structural clarity of the concept map, including the appropriateness of concepts and the use of linking relationships. In addition to the scoring, we also counted the number of unique concepts included in each participant's map, meaning that each concept was measured once per participant, regardless of how many times it appeared in their map. The scoring was initially conducted by one co-author and independently reviewed and confirmed by another co-author to ensure consistency. While this measure reflects the overall learning experience, it also offers preliminary indications of how working with the Canvas may have supported participants' ethical reasoning.

Results

Hereafter, we present the main findings from the evaluations. We begin with results from quantitative analysis, further supported by qualitative findings.

Perception of the EDC's Qualities as an Artifact

The AttrakDiff results (Table 1) provide insight into participants' perceptions of the EDC across its pragmatic quality (PG), hedonic quality (HQ), and attractiveness (ATT). To assess if the mean of these results is significantly positive, we conducted a one-sample single-tail t-test with a hypothesized mean value of 4 ($\mu = 4$). Overall, all but one dimension (Cheap-Premium) were rated positively. The participants particularly rated the canvas as useful (M = 5.73, SD = 0.83) and good (M = 5.58, SD = 1.06).

Adjective Pair	**M**	**SD**	**p-value**
Pragmatic quality (PG)			
Useless - Useful***	**5.73**	0.83	<.001
Impractical - Practical***	**5.35**	1.02	<.001
Confusing - Structured***	**5.12**	1.42	<.001
Complicated - Simple*	**4.69**	1.57	.033
Hedonic Quality (HQ)			
Unimaginative - Creative***	**4.92**	1.09	<.001
Tasteless - Stylish**	**4.92**	1.44	.006
Dull - Captivating**	**4.84**	1.21	.002
Attractiveness (ATT)			
Bad - Good***	**5.58**	1.06	<.001
Ugly - Beautiful***	**5.19**	1.10	<.001
Cheap - Premium	**4.24**	1.42	.407

Table 1. Attrakdiff Results (N = 26), P-Values Correspond to Single Sample T-Tests Compared to μ = 4

Usability of the EDC for Co-designing

During the activity, participants used the EDC in groups, collaborating by writing ideas on Post-it notes. Some groups designated a leader to take notes, while others had all members write their ideas before applying them to the EDC. All groups were discussing new ideas before applying them to the canvas. There was no set order for filling out the EDC, with groups starting at different lenses on the risks and mitigations sections. Overall, they identified 61 ethical risks and 59 strategies to mitigate them. Figure 4 shows the frequency of these instances, with *privacy* accounting for the highest number of risks and mitigation strategies, and *sustainability* accounting for the lowest.

Qualitative findings highlight a progression from ethical reflection to concrete changes in participants' design decisions. Several participants noted that the EDC helped them identify ethical risks they had not previously considered. As one participant explained: *"It helped us to think about additional risks that we didn't think about."* This process of reflection often led to modifications in the proposed solutions. Some participants added new features or adjusted their value proposition in response to the risks identified: *"We created additional features, we updated our value proposition based on the risks that we found."* And another one adds: *"We added the possibility to access the App from the desktop, to increase fairness"* Some decided to remove features to mitigate risks, as one participant explained: *"We had an idea about connecting people together and the privacy risk made us consider not to do that anymore and keep people anonymous."* Finally, some realized the importance of certain features after assessing ethical risks, such as one participant saying: *"For one of the features, we were thinking about having pre-made data that the chatbot would choose from to reply to people using the App. We wanted to remove this feature, but after assessing the ethical risks we decided to keep it as it was a mitigation for multiple risks."*

Effect of the EDC on Ethical Blindness

Our results, illustrated in Table 2, highlight an increase in ethical sensitivity, as evidenced by the changes in the concept maps between the start (Week 0), and the end of the projects (Week 10). Indeed, there was not only a quantitative increase in the number of concepts and relationships but more importantly, also a qualitative increase as evidenced by the significant increase in quality score from (M = 2.35, SD = 0.98) to (M = 4.38, SD = 1.89, t = −4.07, p < .001).

	Week 0		**Week 10**		**p-value**
Metric	M	SD	M	SD	
Concept count*	6.45	2.82	8.6	3.82	.034
Relationship count*	6.45	3.10	8.9	4.30	.027
Quality score***	2.53	0.98	4.38	1.89	<.001

Table 2. Descriptive Statistics and T-Test Results for Ethical Sensitivity Evaluation (N=26)

Figure 5 shows the concepts related to the ethical lenses of the canvas. It indicates that, except for the privacy (20/26) and autonomy (8/26) lenses, participants were mostly unaware of the existence of other risks at the start. It also shows that, at the end of the project, all lenses were mentioned by at least (9/26) participants.

Qualitative findings highlight an increase in ethical reflection among participants. As one participant noted: *"This way to assess risk, do risk-benefit analysis, [and] user POV, helped me see risks I didn't see before."* Others indicated that the canvas helped them structure their ethical reasoning and expand their knowledge of ethical risks: *"I learned the risk evaluation of AI for privacy, autonomy, sustainability."*, *"[Before the use of the canvas] we didn't see through all of the different difficulties that [our] user could have using our device and the ethical risks that could come with it. The canvas helped us see it."*

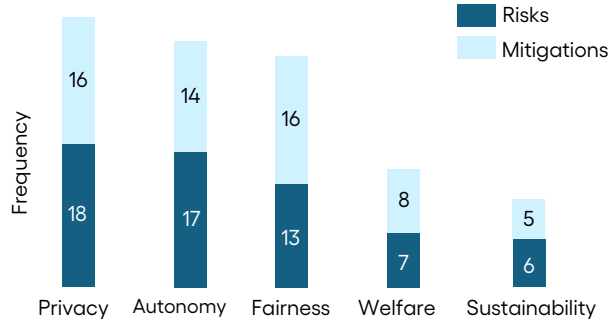

Figure 4. Frequency of Risk and Mitigation Instances Across Different Ethical Lenses During the Workshop Session

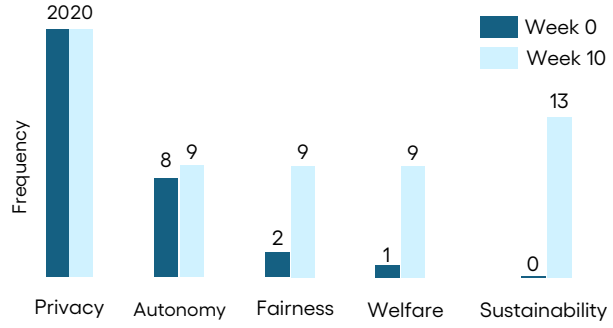

Figure 5. Participant Coverage of Concepts Related to the Five Ethical Lenses for Week 0 and Week 10

Discussion

This paper investigates the potential of a visual inquiry tool, the Ethics-by-Design Canvas (EDC) to reduce ethical blindness and facilitate the identification of mitigation strategies for ethical risks during the design phase of digital innovation projects.

Theoretical Implications

Our results suggest that individuals untrained in ethical risks tend to overlook risks related to fairness, welfare, and sustainability. This aligns with previous research suggesting that ethics is generally considered an ill-structured problem (Hoffmann and Borenstein, 2014), which is challenging to address and

recognize (Berry et al., 2013; Palazzo et al., 2012). Our results highlight that individuals tend to recognize risks related to privacy, even without specific training. This could be explained as those risks have been prominent in recent years, with particular attention given to issues like data breaches and specific regulations implemented to address them, such as the institutionalization of privacy concerns through legislation and widely adopted frameworks (i.e. privacy-by-design) (Yang, 2024). Our findings suggest that if comparable structural emphasis were placed on values such as fairness or sustainability, awareness and recognition of these ethical risks could similarly be enhanced. Our results showed that introducing the EDC in a digital innovation project seems to reduce ethical blindness between the beginning and the end of the project and encouraged participants to reflect on ethical risks in ways that shaped their group discussions and design choices. This highlights the value of a pluralistic approach to ethics in digital innovation, integrating multiple ethical lenses in the EDC (*welfare, fairness, autonomy, privacy, and sustainability*). This aligns with recent calls in the literature for more holistic ethical frameworks that go beyond single-theory approaches (Burr et al., 2020; Dignum, 2019; Markendahl et al., 2017). However, this presented challenges. The design of the Ethics-by-Design Canvas (EDC) involved crucial decisions about which ethical lenses to include. The selected lenses cover most ethical risks in digital innovation, but other relevant lenses, such as explainability and accountability, were excluded. Additionally, ensuring that users can work with potentially conflicting ethical considerations (e.g., privacy vs. transparency) is challenging. *Future research* could explore the ethical *tensions* existing between different ethical lenses. This would aim to identify how trade-offs between different ethical dimensions (e.g., privacy vs. autonomy) are handled (Knight et al., 2025). Exploring how teams navigate competing ethical priorities would provide valuable insights. Additionally, research could focus on mapping ethical considerations within a specific problem space. Creating visual representations of these ethical landscapes could help designers more easily identify relevant ethical lenses for their projects.

Implications for Practitioners

The results from the co-design workshop suggests that the EDC can be used fruitfully in a real co-design project, leading to the identification of previously unseen ethical risks and the development of adequate mitigation strategies. It appears to support team collaboration, which is crucial to address such challenges (Hoffmann and Borenstein 2014; Palazzo et al. 2012). The EDC offers several practical implications for digital innovation projects. First, it provides a concrete tool that can be integrated into existing design processes, particularly within Agile methodologies (Osterwalder et al. 2015). This integration could help organizations operationalize ethical considerations without significantly disrupting their current workflows (Palazzo et al. 2012). Second, the EDC could serve as a valuable training tool for novice designers, helping them develop a more nuanced understanding of ethical implications in their work. Organizations could use the EDC as part of onboarding processes or ongoing professional development initiatives. However, successful implementation of the EDC in real-world contexts will likely require organizational buy-in and a culture that values ethical reflection (Sison et al., 2020). Organizations may need to allocate dedicated time and resources for using the EDC and potentially adapt their project timelines to accommodate more thorough ethical considerations (Brey 2012). Indeed, the EDC will probably not be able to address ethical blindness induced by high-pressure innovation environments, but would be well-suited for organizations with core values emphasizing human flourishing and social responsibility. Research demonstrates that organizations with strong ethical cultures are more receptive to innovation frameworks that embed ethical considerations (Riivari and Lämsä, 2014). This includes organizations in sectors such as healthcare technology, educational software development, civic technology, and social enterprises (Powell et al., 2022; Saldivar et al., 2019). Small to medium-sized companies and startups that have not yet established rigid development processes may also be receptive to integrating ethical reflection tools like the EDC (Brozović et al., 2025). *Future research* could explore how the EDC might be customized for different industries. This could involve developing industry-specific ethical lenses or adapting the tool for particular technological domains (e.g., AI, IoT, blockchain), as well as adaptable versions of the EDC, such as a modular approach where practitioners select from a bigger set of pre-defined ethical lenses based on their specific needs and requirements. *Future research* could also explore how the EDC can be integrated with other design tools and methodologies (e.g., user story mapping, journey mapping), which would provide insights into creating more integrated ethical design processes. Additionally, investigating how the EDC complements existing ethics assessment frameworks, such as Algorithmic Impact Assessments (AIAs), Fundamental Rights Impact Assessments (FRIAs), and Responsible Data Assessment tools, as well as quality management methodologies like

Failure Mode and Effects Analysis (FMEA), could reveal opportunities for developing hybrid approaches. The EDC's collaborative brainstorming approach could serve as a preparatory step before engaging with these more structured assessment methodologies, combining early-stage ethical ideation with systematic risk evaluation.

Potential Moral Imagination Barriers

The positive usability results of the Attrakdiff questionnaire suggests that the EDC managed to simplify the ill-structured problem of ethical risks in a digital innovation project. Indeed, all pragmatic qualities were rated positively (useful, practical, structured, simple). This suggests that the EDC is an improvement over similar initiative (Hardebolle et al., 2023). However, it is important to acknowledge the potential drawbacks of such a tool. One concern is that the structured nature of the EDC, while helpful in guiding ethical reflection, might lead to a *"checklist mentality"* where users focus solely on the predefined ethical lenses without considering other potential ethical issues (Palazzo et al., 2012). Additionally, the EDC's effectiveness relies heavily on users' engagement and willingness to critically reflect on ethical implications. *Future research* could explore alternative tool formats beyond the canvas approach. These might include developing interactive digital platforms that guide users through ethical considerations in real-time or creating collaborative online workspaces that enable team members to contribute to ethical discussions asynchronously (and anonymously) to increase engagement (Zhang et al., 2014).

Limitations

Developing moral imagination towards consideration of human flourishing in digital innovation is only a component of ethical practice. Even when ethical issues are identified, designers may not be able to act upon issues that could negatively affect business outcomes. This may be a particular issue in large corporations such as Meta or Google, where ad revenues depend on the time users spend online and how much they share information. As such, these goals are at odds with reducing social media addiction or ensuring privacy. In this paper, we considered this context out of scope. In addition to the limitations discussed earlier, this study has other limitations that future research could explore and address. The evaluation settings involve a small number of participants ($N = 26$) and groups ($N = 11$). All participants were students, which may affect the generalizability of the findings to professional contexts. Furthermore, without a control group, we cannot attribute the observed improvements in ethical sensitivity to the canvas alone, as they may be influenced by the overall course experience or workshop setting. The results should be replicated and further validated, ideally with professional designers. Additionally, the constrained timeframe (10 weeks long) may not fully capture the long-term effects of using the EDC and its outcomes.

Conclusion

This paper investigates how a visual inquiry tool can reduce ethical blindness in digital innovation projects. It presents the Ethics-by-Design Canvas (EDC), a visual inquiry tool that frames ethical risk through five main lenses: *Welfare, Fairness, Autonomy, Privacy,* and *Sustainability*. These lenses are put in perspective with potential mitigation strategies to foster subsequent design iterations. Our evaluation shows positive results in terms of usability and reducing ethical blindness.

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