# On the Definition of a Method for Specifying Accessibility Requirements: Early Insights from a Focus Group with Practitioners'

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## **ABSTRACT**

Accessibility remains a significant challenge in software development, often due to the lack of structured and actionable guidance for specifying requirements that address diverse user needs. This paper introduces Path4All, a lightweight and user-centered method that integrates Personas, User Stories (US), Behavior-Driven Development (BDD), and WCAG guidelines to support the clear and consistent specification of accessibility requirements. To gather early insights into the method's applicability, we conducted a focus group with experienced software professionals who applied Path4All in a practical, scenario-based activity. The findings suggest that Path4All fosters empathy, improves requirement clarity, and promotes the production of actionable and inclusive specifications. Participants highlighted the method's potential benefits, while also identifying challenges related to WCAG complexity, organizational culture, and the need for clearer role definitions. These initial results point to Path4All's potential to support inclusive design practices from the early stages of development.

### **KEYWORDS**

Accessibility Requirements, User Stories, Personas, Behavior-Driven Development, WCAG

# 1 Introduction

Disability is an intrinsic part of the human condition, affecting most individuals at some point in their lives, whether temporarily or permanently [12]. Globally, approximately 1.3 billion people—16% of the world's population—live with disability. These conditions span a wide range of domains, including visual, auditory, physical, speech, cognitive, neurological, and other impairments [12].

In Brazil, the 2019 Pesquisa Nacional de Saúde revealed that 17.3 million people aged two years or older reported having at least one disability [4]. The prevalence of disability increases with age, a trend already evident in the 2010 census, and is expected to intensify as Brazil's population continues to age [3]. These demographic shifts underscore the urgent need to address accessibility as a structural and forward-looking concern in technology development.

Despite legal frameworks promoting digital accessibility, compliance remains limited. A survey with IT professionals [11] highlighted that many software companies overlook accessibility standards, often due to a lack of awareness or weak regulatory enforcement. Profit-oriented cultures tend to deprioritize inclusion unless mandated by clients or laws. The results also revealed widespread

unfamiliarity with guidelines such as WCAG, pointing to the need for training, awareness, and clearer operational guidance.

One critical issue is the lack of structured and practical support to specify accessibility requirements early in the development lifecycle. Although guidelines like WCAG offer important benchmarks, they are not always translated into concrete, actionable, or testable requirements. As a result, accessibility is often treated as an afterthought rather than as an integral design commitment. Teams tend to rely on implicit assumptions that all users interact with systems in conventional ways, overlooking the diverse needs of real users.

This paper addresses this gap by introducing Path4All, an integrated method designed to support software teams in specifying accessibility requirements from the early stages of development. Path4All brings together Personas, User Stories (US), Behavior-Driven Development (BDD), and WCAG criteria into a lightweight and empathy-driven process.

To guide our investigation, we posed the following research question: How do professionals perceive the method's usefulness for specifying accessibility requirements? What benefits, challenges, and other factors emerge from the use of the method in practice?

To explore these questions, we conducted a structured focus group with software professionals who applied the method in a hands-on activity. The results provide initial insights into the method's applicability, its perceived benefits and limitations, and how it may foster cultural and procedural shifts toward inclusive development practices.

# 2 Related Work

Akoumianakis [1] introduces a process-oriented framework for managing universal accessibility as a non-functional requirement (NFR) throughout the software development lifecycle. Viewing accessibility as a quality attribute that must be satisfied rather than fulfilled, the author proposes a structured method integrating scenario-based design, softgoal interdependency modeling (based on the NFR framework), and context-sensitive adaptation. The proposed process includes three key stages: Universal Access Context Analysis (UACA), Global Execution Context Design (GeCD), and Platform Administration (PA), each supported by specific tools and modeling techniques. Unlike reactive approaches that retrofit accessibility late in development, this framework emphasizes proactive integration of accessibility from the early stages, aiming to support diverse users, platforms, and contexts through adaptable and scalable design strategies.

Method	Focus	Main Techniques	Key Differences
This Work	Requirement elicitation with clarity, empathy, and testability	Personas, User Stories (US), BDD scenarios, WCAG guidelines	Lightweight, empathy-driven, scenario-driven, user-centered, immediately applicable in agile development
Akoumianakis (2009)	Accessibility as a global quality attribute across the lifecycle	Softgoal modeling, scenario-based design, context analysis (UACA, GeCD, PA)	Lifecycle-wide, process-intensive, requires modeling expertise and domain-specific tools
Shirogane (2014)	Early elicitation through disability profiling	Customized checklists, mapping user difficulties to accessibility guidelines (WCAG, JIS)	Quantitative mapping of disability profiles, less participatory, lacks direct link to agile practices or collaboration artifacts
Oliveira et al. (2016)	Traceability and conflict analysis of accessibility NFRs	NFR Framework, Softgoal Interdependency Graphs (SIG), OmnesWeb tool	Tool-dependent, semi-automated, emphasizes structured linkage between NFRs and functional requirements
Miranda (2021)	Agile integration of accessibility practices	Accessibility catalog for web applications, semi-automated web tool for US generation, conflict checklist	Tool dependent, semi-automated, goal-oriented, web-oriented
Miranda et al. (2024)	Conceptual modeling of accessibility in agile development	UML-based conceptual model integrating assistive technologies, personas, US, WCAG	High-level model, formal relationships between concepts, requires validation and is less operational in practice

Table 1: Comparison of Accessibility Requirements Methods

Shirogane [8] presents a method for the early elicitation of accessibility requirements by systematically analyzing users' disability profiles and mapping them to relevant elements of established accessibility guidelines. The approach incorporates customized checklists to identify both explicit and latent user difficulties, which are subsequently quantified and associated with specific guideline components (e.g., WCAG 2.0 and JIS X 8341-3). This quantitative mapping yields a prioritized set of accessibility requirements that are contextually adapted to users' needs, thereby reinforcing the importance of integrating accessibility considerations during the initial phases of software development.

Oliveira et al. [7] propose a semi-automated method for eliciting accessibility requirements early in the software development lifecycle, aiming to avoid the high costs and rework associated with addressing accessibility late in the process. Their approach is grounded in the NFR Framework, a method proposed by Chung et al. [2], and incorporates WCAG 2.0 guidelines into a structured accessibility catalogue modeled as a Softgoal Interdependency Graph (SIG). The method systematically links functional requirements with specific media types and disability categories, enabling traceability and the identification of conflicts among NFRs. Supported by the OmnesWeb tool, the method guides analysts through requirement selection, conflict analysis, and artifact generation.

Miranda [5] proposed a Web Accessibility Requirements Framework specifically designed for Agile development environments. The approach addresses the gap between accessibility guidelines and Agile practices by offering a structured method to integrate accessibility early and continuously throughout the software development lifecycle. The framework is grounded in WCAG and is operationalized through a set of artifacts, including an accessibility catalog for web applications structured as a goal-oriented model, user stories for web accessibility conforming to WCAG, and a conflict checklist. The method will be supported by a semi-automated web tool that generates user stories in compliance with WCAG.

Miranda et al. [6] propose a conceptual model to support the integration of web accessibility requirements into agile development processes. The model uses UML diagrams to clarify the relationships of users, assistive technologies, accessibility guidelines (e.g., WCAG), and agile artifacts (e.g., user stories, acceptance criteria, personas). It aims to help agile teams consistently specify, implement, and evaluate accessibility requirements throughout development cycles. By applying the model to a hotel booking website scenario, the authors illustrate how accessibility can be embedded into sprint planning and testing activities. The model is intended to enhance communication, improve requirement clarity, and promote inclusive design practices, with future work focused on validation through expert feedback and empirical studies.

A recent systematic literature review by [9] reinforces these findings by identifying persistent challenges in integrating accessibility requirements into the development process, such as the lack of support for early-stage specification, limited operational guidance for applying WCAG, and the absence of methods that connect technical standards with user-centered practices.

While these approaches offer valuable contributions, most rely on tool support or conceptual models and are often complex to adopt in everyday agile development. Few methods offer a lightweight and user-centered approach that teams can apply directly during requirements specification.

Our work seeks to address this gap by integrating techniques that are already familiar to agile teams—Personas, User Stories, BDD—and aligning them with accessibility standards such as WCAG. In contrast to methods that are tool-dependent or model-intensive, Path4All focuses on empathy, simplicity, and testability. Although our method is not directly derived from any single previous approach, it is inspired by the broader recognition that accessibility must be embedded from the early stages of development. In this sense, it builds on the gaps mapped by Teixeira et al. [9] and offers a structured yet practical alternative that promotes inclusive design practices from the ground up.

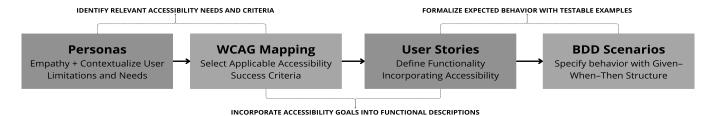


Figure 1: Relationships among the method's elements

# 3 Proposed Method – Path4All

Path4All is a lightweight method that integrates Personas, WGAC, US, and BDD, and WCAG guidelines to support the early specification of accessibility requirements. It was designed to be familiar to agile teams, while fostering empathy and ensuring that accessibility criteria are translated into actionable and testable artifacts.

The method emerged iteratively through classroom applications followed by refinement based on qualitative feedback. Its structure reflects both practical constraints of development teams and gaps observed in the literature—such as the difficulty of translating WCAG into concrete requirements and the lack of alignment between user context and technical specifications.

The selection of components in Path4All is based on their complementary roles. **Personas** represent realistic user profiles, including users with disabilities, and foster empathy while contextualizing accessibility needs. **WCAG** provides a normative technical foundation, guiding the formulation of accessibility requirements. **User Stories** describe user-centered functionality and incorporate accessibility requirements in a clear and understandable manner. Finally, **BDD** uses scenarios to specify testable accessibility behaviors, ensuring that the system meets defined accessibility goals.

# 3.1 Integration of the Components

The Path4All method unfolds in four main steps, where the components are integrated sequentially (see Figure 1):

- Persona Analysis: Teams begin by analyzing the needs, limitations, and preferences of specific personas with disabilities.
- (2) **WCAG Mapping:** Relevant WCAG success criteria are identified based on each persona's context and used to inform requirement definition.
- (3) **User Story Writing:** Accessibility-oriented User Stories are written, incorporating the identified WCAG criteria.
- (4) **BDD Scenario Formalization:** Scenarios are written to represent the expected behavior, integrating the accessibility criteria previously identified.

The final outcome of applying the Path4All method is the creation of detailed, actionable accessibility requirements that define how a system should behave in a way that accommodates users with disabilities. These requirements are grounded in the needs of the users (Personas), informed by accessibility guidelines (WCAG), articulated in user-friendly language (User Stories), and specified through BDD scenarios that demonstrate the necessary accessibility behavior related to functionality, enabling it to be tested (BDD). Together, these elements create a pipeline that links the user's context

to the system's expected behavior, reinforcing inclusive design from the ground up. Figure 2 demonstrates how the method is applied.

The method's modular design enables teams to adopt it partially or incrementally. Its emphasis on user context and traceability supports not only requirement clarity, but also discussions across roles and disciplines.

# 4 Focus Group Study

To explore the practicality of Path4All, we conducted a focus group with experienced software professionals. The goal was to gather qualitative insights into how the method supports the specification of accessibility requirements and to identify potential benefits, challenges, and suggestions for improvement.

# 4.1 Design and Procedure

The study adopted an exploratory, qualitative approach. Participants were invited to take part in a structured session lasting approximately 2 hours. The session was divided into three phases: (i) a pre-activity questionnaire, (ii) a practical activity applying the Path4All method, and (iii) a focus group.

The pre-activity questionnaire collected demographic and professional background data as well as self-assessed familiarity with core concepts such as accessibility, WCAG, Personas, User Stories, and BDD. The questionnaire was also used to identify prior experiences with accessibility in practice. Its construction was based on prior instruments used in our previous study [10], and reviewed by a senior researcher for clarity and relevance.

The practical activity followed the Path4All method and was based on a commercial travel application. Participants worked in groups to specify accessibility requirements for different personas using the four components of the method. The activity followed the three main stages of the Path4All method: Discover, Define, and Formalize. In the Discovery phase, participants analyzed the personas and discussed their specific accessibility needs and goals. During the Define phase, they transformed these insights into structured User Stories and began refining them into BDD scenarios.

# 4.2 Data Collection and Analysis

We analyzed three sources of data: (1) responses to the pre-activity questionnaire; (2) artifacts produced during the activity (US and BDD scenarios); and (3) transcripts from the focus group discussion.

The analysis examined how participants applied the elements of the Path4All and how they perceived its benefits and challenges. Particular attention was given to how the structured integration of Personas, WCAG, US, and BDD supported communication and



Name: Lucas Age: 32

**Profile:** A tech-savvy project manager pursuing an MBA in Business Management. Legally blind, he relies on assistive technologies such as screen readers, voice commands, and virtual assistants to navigate digital environments. He values autonomy and accessibility in technology, using devices like iPhone, iPad, and MacBook, and apps such as Slack, WhatsApp, LinkedIn, and Spotify.

#### **Facilitators:**

Full compatibility with screen readers Consistent layout and keyboard/voice navigation

Proper labeling of buttons and alternative text for images/maps

#### **Barriers:**

Unlabeled interactive elements
Disorganized layouts or dynamic menus
Lack of image descriptions
Updates without prior notice
Mouse-only interaction dependencies
Quote: "Technology should not be a barrier,
but a bridge to my autonomy."



#### Mapping:

- **1.1.1 Non-text Content:** All images and icons (e.g., destination thumbnails) must have meaningful alternative text.
- **2.1.1 Keyboard:** All filter and navigation options must be operable via keyboard.
- **2.4.6 Headings and Labels**: Filters and result items must have descriptive headings and labels.

#### 3.1.2 Language of Parts:

Apply correct language attributes if content in other languages appears (e.g., destination names).

#### 3.2.3 Consistent Navigation:

Ensure that the navigation system remains consistent throughout the app.

## 3.2.4 Consistent Identification:

Interactive elements should always be identified the same way (e.g., a "Search" button should not appear as "Find" elsewhere).

- **3.3.2 Labels or Instructions:** Clear instructions should be provided for using filters
- **3.3.3 Error Suggestion:** Offer suggestions to help correct input errors (e.g., "Please enter a valid city name").
- **4.1.2 Name, Role, Value:** All UI components (e.g., buttons, filters) must expose correct information to assistive technologies.



As Lucas, a legally blind project manager who uses screen readers and voice commands

I want to search for vacation destinations using accessible filters and descriptions, so that I can independently find a suitable place to travel that meets my preferences and accessibility needs.



**Scenario:** Search for accessible vacation destinations

**Given** that Lucas is using a screen reader and voice commands to navigate the app And he is on the "Find Destination" page **When** he activates the search filter using a keyboard (2.1.1, 3.3.2, 3.3.3, 4.1.2) or voice command (3.1.2)

**And** selects criteria like destination type, climate, and accessibility features (e.g., step-free access) (2.4.6, 3.2.3, 3.2.4) **Then** the app should return a list of

destinations (2.4.6, 3.2.3, 3.2.4)

**And** each destination should include a concise, screen-reader-friendly description (4.1.2, 3.2.4)

**And** all buttons and interactive elements must have accessible labels (4.1.2, 3.2.4)

Figure 2: Example of Method Usage

fostered a shared understanding of accessibility. Together, these insights offer early evidence of the method's relevance and practicality in professional software development contexts.

#### 4.3 Limitations

The study involved five participants and was conducted in a controlled, simulated setting. While this limits generalizability, it allowed us to explore the method in depth and under consistent conditions. The goal was not to produce statistical evidence, but rather to uncover practical considerations and initial reactions to the method's design.

# 5 Preliminary Findings

This section presents the preliminary findings of the study in relation to the research questions, drawing on qualitative evidence from the focus group conducted with software professionals. The results highlight how participants perceived and interacted with the proposed method, which integrates Personas, WCAG, User Stories, and Behavior-Driven Development.

The focus group comprised a diverse group of five IT professionals, with an average of six years of industry experience, ranging from three to ten years. Participants held various roles, including software developers, UI/UX designers, and project and product managers. Table2 provides an overview of the participants' profiles.

**Table 2: Participants Profile** 

ID	Role	System	Experience	<b>Company Size</b>
P1	Dev	Web	5yrs	Large
P2	UX	Web, Mob, RT	6yrs	Large
P3	Dev	Web	3yrs	Large
P4	Dev	Web, Dkt, Leg	6yrs	Medium
P5	PM	Web, Mob	10yrs	Micro

Dev = Developer, UX = UI/UX Designer, PM = Project/Product Manager, Mob = Mobile, RT = Real-Time, Dkt = Desktop, Leg = Legacy

Participants applied a structured approach to map WCAG success criteria to the specific needs of a blind user, represented by a defined persona. The process began with a detailed analysis of accessibility challenges—such as navigating dynamic content, unlabeled buttons, and inconsistent layouts. Based on these, participants consulted the WCAG guidelines and made explicit connections—for example, linking WCAG 1.1.1 to the need for alt text and WCAG 2.1.1 to full keyboard access. These criteria were then translated into BDD scenarios that clearly expressed expected system behavior from the user's perspective. This exercise demonstrated how the method effectively transforms user-centered insights into precise, standards-based accessibility requirements, reinforcing its practical value in real development contexts. Figure 3 shows artifacts created during the activity. All handwritten content is in Brazilian Portuguese, reflecting the original language used by participants.

Participants successfully mapped multiple WCAG success criteria to the persona's needs, covering at least one from each POUR principle (Perceivable, Operable, Understandable, Robust). Table 3 summarizes the identified and potentially relevant criteria.

Table 3: WCAG Criteria for Persona Lucas

Criterion	POUR	Relevance	Mapped
1.1.1	Perceivable	Image and icon interpretation by screen reader	Yes
1.3.1	Perceivable	Semantic structure for form fields and layout	No
2.1.1	Operable	Enables keyboard-only interaction	Yes
2.4.3	Operable	Logical tab navigation order	No
2.4.7	Operable	Visible focus indication dur- ing navigation	No
3.2.2	Understandable	Prevents unexpected changes from input	Yes
3.2.3	Understandable	Keeps layout and navigation consistent	Yes
4.1.1	Robust	Structured code for assistive technology	No
4.1.2	Robust	Labels and roles for interac- tive elements	Yes

# Coverage and Gaps in WCAG Mapping

The WCAG mapping activity revealed both strengths and limitations in how participants identified and applied accessibility guidelines. As shown in Table3, participants effectively addressed several key criteria, particularly those closely tied to direct interaction and content perception. Notably, they mapped criteria such as **1.1.1** (Non-text Content), **2.1.1** (Keyboard), **3.2.2** (On Input), **3.2.3** (Consistent Navigation), and **4.1.2** (Name, Role, Value), which align with the persona's challenges.

However, a few important criteria were not explicitly identified during the session, even though their relevance to the scenario was evident. These included structural and navigational criteria such as **1.3.1** (Info and Relationships), **2.4.3** (Focus Order), and **2.4.7** (Focus Visible). Although participants intuitively discussed the importance of navigation consistency and clarity, these elements were not formally mapped to WCAG success criteria.

This suggests that the Path4All method effectively supports the recognition of more visible and directly testable aspects of accessibility, especially when grounded in persona-driven scenarios. However, to deepen coverage of WCAG, the method may benefit from additional scaffolding, such as simplified guideline summaries, POUR-aligned checklists, or visual aids. As noted by one participant, "Some guidelines weren't that well described... I was a little confused" (P3), indicating that the technical nature of WCAG remains a barrier to broader understanding and application.

Overall, these findings indicate that while Path4All enhances empathy and contextual awareness, future iterations of the method could expand its instructional scope to ensure more complete and consistent alignment with accessibility standards.

The Path4All method positively influenced participants' understanding of accessibility by encouraging them to reflect on the lived experiences of users with disabilities. The use of personas was particularly effective in fostering empathy and guiding the reasoning process. As one participant noted, "Imagine you are a blind person. You need to place yourself in their situation to really understand how they use the system" (P5). This empathy-based approach helped participants shift from abstract technical concerns to concrete user challenges. Another reflected, "Once I understood the persona's full problem, I could think about how to adapt that into a structure" (P5).

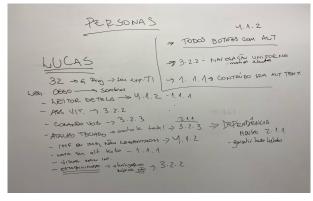
Participants emphasized that the persona element was foundational to this shift in perspective. "Usually we get straight to solving the problem. But starting with the persona made me stop and think about their real challenge first" (P2). This process helped them move from intention to action, as summarized by one participant: "The method helps transform intention into action" (P5). Another added, "The persona gave me context. Without it, I'd just be applying rules without meaning" (P1).

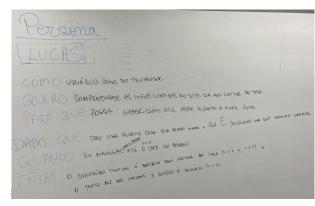
In addition to promoting awareness, the structured format supported clearer communication among team members. "The BDD structure made it clearer than simply writing a requirement" (P3), one participant noted. Another stated, "If I received a requirement like that, I would know exactly what to do" (P2). Path4All helped different roles speak the same language "The method helps create a shared language between PO, dev, and UX" (P5).

Participants found Path4All useful for specifying accessibility requirements, highlighting its clarity and purposeful structure through personas and BDD. One participant explained, "If I received a story like this, I believe I could develop much better because it maps what can happen and what must be done" (P2). Another reinforced this view: "If I had received requirement descriptions like this, I believe it definitely would have brought accessibility to the system functionalities" (P1).

One key benefit was the empathy generated by personas. "The most valuable part was having the persona description, even before the techniques. That already brought many insights" (P2). Another participant noted: "When I read the persona, I understood the behavior, and only then I thought about how to write the requirement" (P5). These statements reflect the method's capacity to initiate reflective and empathetic thinking.

However, participants also identified challenges. The BDD structure was seen as difficult to apply without first understanding the user: "The BDD [scenario] structure by itself was not a turning point for me. What made the needs clearer and what WCAG suggests was first identifying the persona's profile" (P5). WCAG guidelines were often viewed as too technical: "Some guidelines weren't that well described... I was a little confused" (P3); "They're very technical if we don't understand them, we don't know how to apply them" (P4).





(a) Discovery Stage

(b) Define and Formalize Stage

Figure 3: Application of the Path4All Method

The method was perceived as both applicable and beneficial, promoting clear, accessible requisites, increased awareness, and more inclusive design practices.

To understand how Path4All elements interact, we analyzed their integration during the activity. The combination of Personas, WCAG, US, and BDD helped participants progress from empathy to action. Preliminary findings indicate that Path4All supports the specification of accessibility requirements by combining empathy with structured and standards-based artifacts. Participants appreciated its practicality, particularly how personas helped anchor technical decisions in real user needs. Although BDD and WCAG were useful, some participants found them difficult to apply without clearer guidance. Overall, the method was seen as effective in promoting clarity, awareness, and inclusive design practices.

## 6 Final Remarks and Future Work

This paper presented Path4All, an integrated method for specifying accessibility requirements that combines Personas, WCAG criteria, User Stories, and BDD. Designed to be practical and empathetic, the method supports agile teams in translating user needs into structured and testable artifacts.

Our focus group study offered initial insights into the method's applicability and perceived usefulness. Participants reported that Path4All helped clarify accessibility goals and facilitated collaboration around user-centered requirements. The integration of Personas and BDD scenarios was particularly appreciated, while the WCAG component was identified as the most challenging, highlighting the need for better operational support.

These findings reinforce concerns raised in the literature about the gap between accessibility standards and development practice, particularly the lack of support for early-stage specification, operationalization of WCAG, and the integration of user-centered techniques. Path4All addresses these gaps by providing a cohesive process that links user context with normative criteria and testable requirements.

However, our study was exploratory and involved a limited number of participants in a simulated setting. The results, while encouraging, are not generalizable and should be interpreted as formative evidence.

**Future work** will focus on advancing the validation and refinement of Path4All through the following steps:

- Conducting multiple case studies in real-world software development teams to evaluate the method's applicability under practical conditions.
- Assessing the impact of the method on accessibility awareness, requirement clarity, and team collaboration.
- Refining support materials, including: WCAG mapping aids; Illustrated examples tailored to common user needs.
- Exploring opportunities for partial automation of the method's steps, particularly the mapping between user context and WCAG criteria.
- Performing comparative studies with alternative accessibility methods to evaluate trade-offs in clarity, coverage, and adoption feasibility.

Ultimately, we expect Path4All to contribute to the systematic integration of accessibility into the software development lifecycle, making accessibility requirements more actionable, traceable, and aligned with user needs.

## ARTIFACT AVAILABILITY

The instructional materials and questionnaire used in this study-including activity guidelines, personas, templates, and examples-are available at: https://doi.org/10.6084/m9.figshare.29066540. If unavailable, please contact the authors.

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