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An Open-Source Framework for Human-Centred AI Persona Development

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Abstract: *Artificial intelligence (AI) systems increasingly support decisions in education, healthcare, public services, and business. Yet a technically accurate model may still be difficult to use when people cannot understand its limits, interpret its outputs, or decide when to rely on it. This paper proposes an open-source framework for developing AI-focused user personas that make these human factors visible during system design. The framework extends conventional persona practice by explicitly recording users' tasks, skills, context, expectations, trust, acceptance, willingness to use AI support, and explanation needs. It organises development into five stages: identifying stakeholder groups, collecting user evidence, analysing the evidence, documenting persona foundations, and creating validated persona sheets. The paper also outlines a reusable toolbox structure containing research prompts, questionnaire templates, analysis aids, persona templates, and validation checklists. As a conceptual design paper, it does not claim empirical performance gains; instead, it defines a practical workflow and an evaluation plan for future studies. The intended contribution is a transparent, adaptable starting point for teams designing human-centred AI applications.*

Keywords: Human-centred artificial intelligence, user personas, human–AI interaction, explainable AI, open-source tools, user-centred design

I. INTRODUCTION

AI is no longer confined to specialist software or research laboratories. Recommendation systems, conversational assistants, automated classification, and decision-support tools now influence routine work. Their usefulness depends not only on model quality but also on how people understand and act on the system's outputs. A prediction can be statistically strong and still be unsuitable for a user who does not know what the prediction means, what information influenced it, or when it should be challenged.

Traditional user-centred design offers methods for learning about people before designing interfaces. One such method is the persona: a research-informed representation of a recurring user pattern, including goals, tasks, constraints, motivations, and frustrations. Personas can help a multidisciplinary team discuss the same user needs rather than relying on assumptions. Cooper's work helped establish personas as a practical design method, while later research has examined their value and the importance of grounding them in evidence.

AI-enabled products introduce additional design questions. The system may adapt over time, return probabilistic outputs, behave differently across contexts, or provide recommendations whose reasoning is not immediately visible. The user's relationship with the system therefore includes more than usability. It also includes trust calibration, willingness to accept assistance, perceived control, understanding of uncertainty, and the ability to contest or verify an output. Research on explainable AI similarly emphasises that an explanation is useful only when it supports the understanding and needs of its intended audience.

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II. EXISTING SYSTEM

- **Broad & Generic User Categorization:** Traditional development teams categorize users using wide, generalized labels such as "expert," "beginner," or "decision-maker," which fail to explain specific workflow requirements[cite: 2].
- **Absence of AI-Specific Factors:** Traditional persona profiles omit critical human-AI interaction dynamics, such as trust calibration, willingness to accept assistance, explanation needs, and perceived control over probabilistic outputs.
- **Static / Decorative Profiles:** Personas frequently turn into unverified, decorative profiles because they are isolated from primary research and lack systematic updates.
- **Assumption-Based UI/UX Design & Unverifiable Decisions:** Without an evidence register or traceability mechanism, interface decisions rely on designer assumptions rather than auditable, evidence-backed user needs.

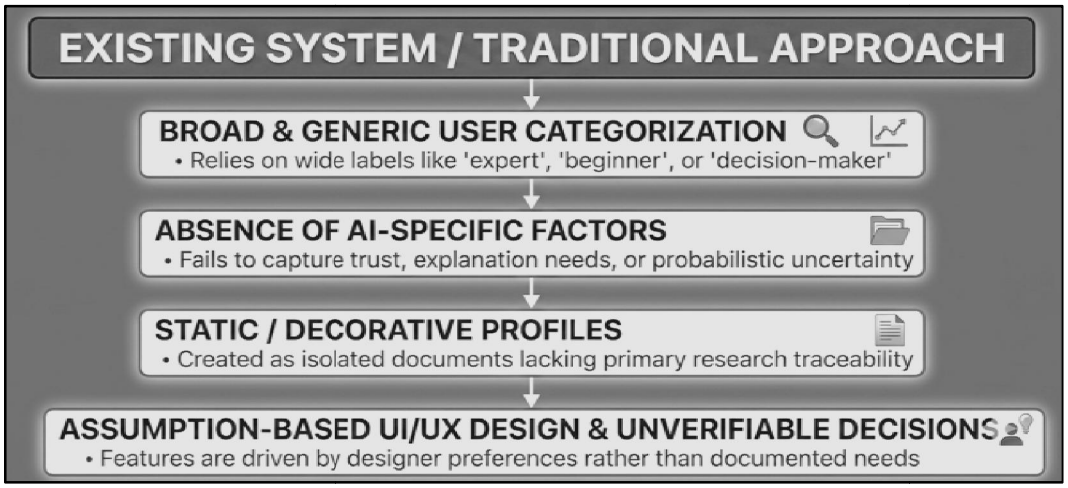


Fig 2. Existing System

III. LITERATURE REVIEW

A. Personas and User-Centred Design:

1. "Personas and User-Centered Design: How Can Personas Benefit Product Design Processes?"

Authors: Tomasz Miaskiewicz and Kenneth A. Kozar
Year of Publication: 2011
Journal Name: Design Studies
Volume and Issue: Volume 32, Issue 5
DOI: 10.1016/j.destud.2011.03.003
Description:
Miaskiewicz and Kozar examined how personas can support user-centred product design by representing user needs, goals, and behavioural patterns. Their study discusses the potential benefits of personas in helping design teams understand users and make informed product decisions. The work provides a foundation for using personas as practical tools during the design process. However, persona effectiveness depends on the quality of the supporting research and the extent to which the profiles influence actual design decisions [2].

2. "Design Personas—New Ways, New Contexts"

Author: Lene Nielsen
Year of Publication: 2018

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Journal Name: Persona Studies
Volume and Issue: Volume 4, Issue 2
DOI: 10.21153/psj2018vol4no2art799
Description:
Nielsen discusses the use of design personas in different fields and contexts. The paper highlights how personas represent users' goals, experiences, needs, and everyday behaviours to support design and innovation. It also demonstrates the importance of selecting an appropriate persona-development approach according to the intended application. This research supports treating personas as flexible design artefacts that should be adapted to the needs of a particular project rather than as fixed descriptions of user groups.

B. Human–AI Interaction and Explainability:

3. "Personas for Artificial Intelligence (AI): An Open Source Toolbox"
Authors: Andreas Holzinger, Michaela Kargl, Bettina Kipperer, Peter Regitnig, Markus Plass, and Heimo Müller
Year of Publication: 2022
Journal Name: IEEE Access
Volume: Volume 10, Pages 23732–23747
DOI: 10.1109/ACCESS.2022.3154776
Description:
Holzinger et al. extend traditional persona development to human–AI interaction and present an open-source toolbox for creating AI personas. The study considers factors such as trust, acceptance, and assent, which are important when users interact with AI-based systems. It also describes a five-step persona-development process illustrated in a medical AI context. The present study builds on this work by proposing explicit evidence traceability, documentation of uncertainty in persona claims, and systematic mapping between user characteristics and interface requirements.

IV. RESEARCH GAP

The reviewed studies establish the importance of personas in user-centred design, explain the challenges of human–AI interaction, and provide an existing toolbox for AI persona development. Nevertheless, the present study proposes a more explicit workflow specification that connects persona statements to their supporting evidence, records uncertainty in interpretations, and maps identified user needs to concrete interface requirements. It also proposes an evaluation plan for assessing the consistency, usability, and practical value of the toolbox.

These elements are the proposed focus of the present framework, rather than claims that earlier studies entirely overlooked these concerns. The framework is a conceptual contribution and requires implementation and empirical evaluation to establish its effectiveness.

V. PROPOSED SYSTEM

- **Guidance Category:** Contains foundational resources like the step-by-step guide for process flows and best practices, alongside interview guides and short questionnaires to structure field research.
- **Data & Analysis Category:** Houses core operational templates including the stakeholder-mapping worksheet, evidence register for logging observations, affinity-analysis worksheet for clustering themes, persona foundation template, and one-page persona sheet templates.
- **Design Mapping Category:** Features the evidence-to-requirement mapping table to trace user needs directly into technical specifications, backed by a validation checklist for quality assurance and completeness reviews.
- **User Evidence Input:** Represents raw qualitative and quantitative data gathered from field research, interviews, or workflow observations (e.g., a user needing to verify a high-impact prediction).

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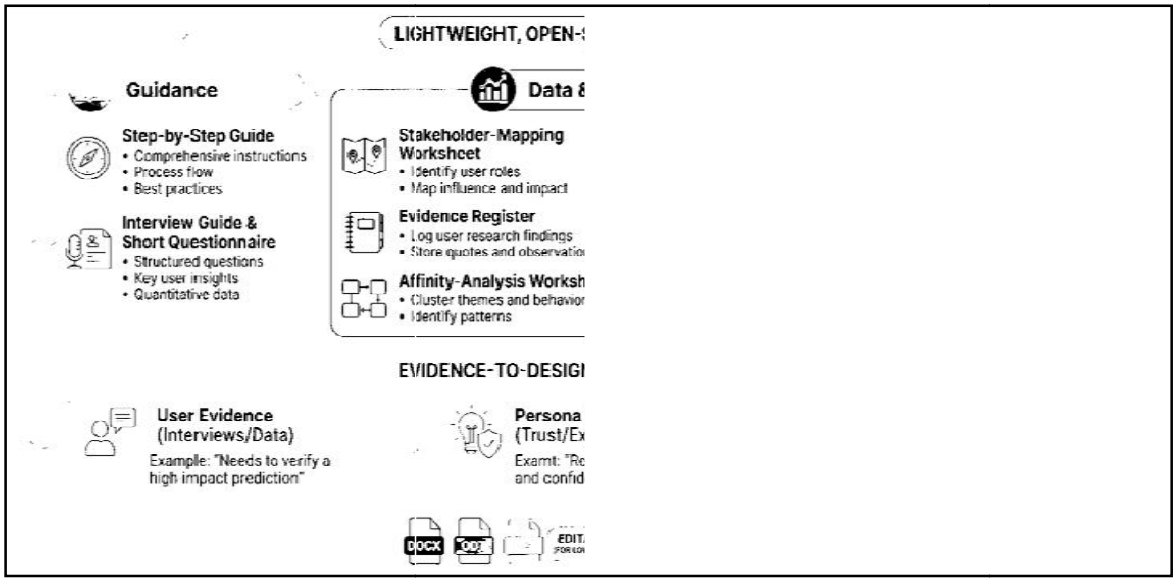


Fig. 2 Proposed System

- **Persona Need Translation:** Converts raw evidence into specific AI interaction requirements such as trust calibration, explanation needs, and confidence limits.
- **Design Requirement Output:** Translates persona needs into concrete interface features, such as displaying a clear rationale, showing confidence thresholds, and providing an option for human review.
- **Editable File Formats:** Encompasses low-barrier, open-source file types (DOCX, ODT, XLSX, CSV, and presentation templates) that allow teams to use and modify the toolbox without expensive proprietary software.

VI. METHODOLOGY

A. **Proposed Five-Stage Workflow**

Stage 1 — Identify stakeholder groups. List people who use the AI tool directly and those who must interpret, audit, maintain, or be affected by its outputs. In a college learning application, for example, relevant groups might include students, teachers, administrators, accessibility support staff, and technical maintainers. The list should be adapted to the actual system rather than reused unchanged.

Stage 2 — Collect user evidence. Use semi-structured interviews where feasible, supplemented by short questionnaires, workflow observation, document review, or contextual research. Questions should cover tasks, skills, goals, constraints, frustrations, prior experience with AI, trust, acceptance, desired control, and explanation needs. Record the method, date, participant role, and limitations of each source. Do not treat online research as equivalent to direct user evidence.

Stage 3 — Consolidate and analyse. Store observations in a structured evidence register. Use thematic coding or affinity grouping for open-ended responses and descriptive summaries for structured responses. Look for meaningful differences in workflow, expertise, risk tolerance, technology familiarity, and attitudes towards AI. Do not create separate personas for every minor difference; create them when the difference changes design decisions.

Stage 4 — Prepare a persona foundation record. For each proposed persona, record its purpose, tasks, environment, skills, goals, motivations, frustrations, AI experience, trust conditions, explanation requirements, desired control, and consequences of incorrect output. Every important claim should have a source reference or be marked as an assumption requiring validation. Include a confidence label such as high, medium, or low based on the quantity and consistency of available evidence.

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Stage 5 — Visualise and validate. Turn the foundation record into a concise persona sheet. A visual profile may improve communication, but names, photos, age, and personal details should not be used to imply unsupported demographic facts. Ask representative users or domain experts whether the profile is plausible and whether it helps identify concrete design requirements. Revise the persona when feedback or new evidence contradicts it.

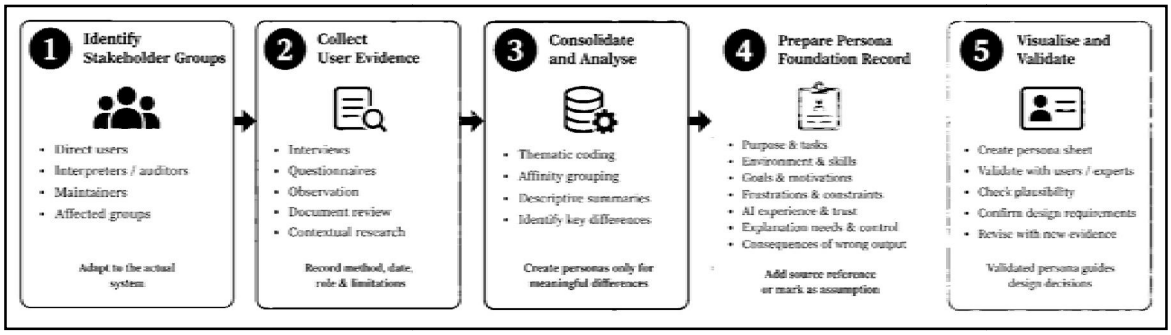


Fig.3 Methodology for AI Persona Development

B. Proposed Toolbox Components

The toolbox is specified as a lightweight, open-source repository that can be used without a paid persona-design platform. It should contain:

- a step-by-step guide;
- stakeholder-mapping worksheet;
- interview guide and short questionnaire;
- evidence register; (5) affinity-analysis worksheet;
- persona foundation template;
- one-page persona sheet template;
- evidence-to-requirement mapping table; and
- validation checklist. Editable formats such as DOCX, ODT, XLSX, CSV, and presentation templates can lower the barrier to adoption.

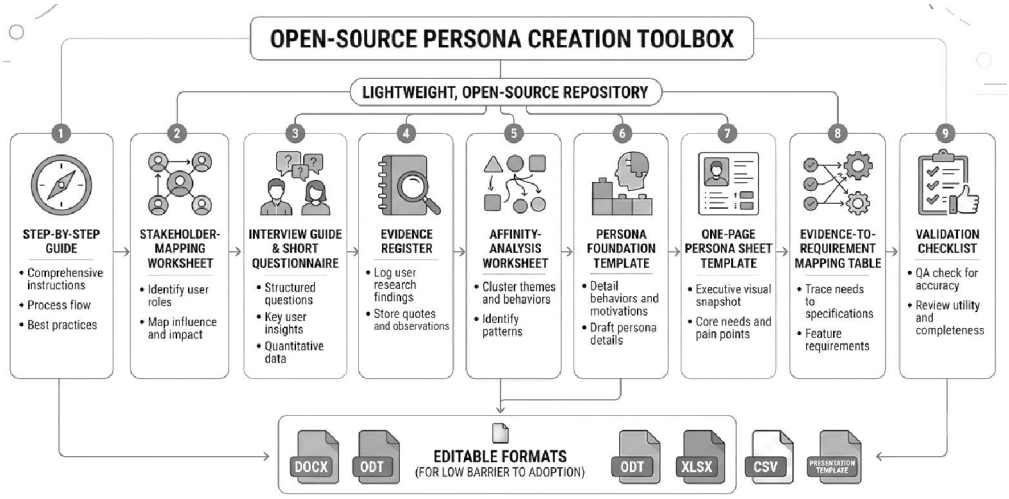


Fig.4 Toolbox Components

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C. Evidence-to-Design Traceability

A distinguishing element of the proposed framework is a traceability table. Each user need is connected to the supporting evidence, the persona field, and a design response. For example: "needs to verify a high-impact prediction" → interview or workflow evidence → "requires visible rationale and confidence limits" → interface requirement for evidence display and human review. This structure makes it easier for a team to check whether a proposed feature responds to a documented need or merely to a designer's preference.

D. Ethical and Privacy Considerations

Persona research should collect only information needed for the design purpose. Participant consent, secure storage, anonymisation, retention limits, and permission for quotations or images should be considered before collection begins. Small groups can be identifiable even when names are removed. Teams should avoid using personas to reinforce stereotypes or to infer sensitive traits without a clear, lawful, and ethically justified purpose. AI personas should also document who may be excluded by the current evidence and what further research is needed.

VII. RESULTS AND DISCUSSION

Because this manuscript proposes a framework and does not report a completed user study, its results are design outputs rather than measured performance outcomes. The primary output is a structured workflow connecting stakeholder identification, evidence collection, analysis, persona documentation, and validation. The second output is a proposed repository structure with reusable artefacts. The third is the evidence-to-design traceability mechanism.

A. Expected Practical Value

For novice teams, a guided sequence and ready-to-edit templates can clarify what information to collect and when a persona is sufficiently supported to be useful. For experienced teams, the evidence register and traceability table can help maintain consistency across research, design, engineering, and governance activities. These benefits are plausible design hypotheses and should be tested rather than reported as proven outcomes.

B. Example Application: AI-Assisted Learning

Consider a proposed AI assistant that recommends programming exercises to undergraduate students. One possible persona is a learner who benefits from recommendations but worries that the system may repeatedly assign tasks that are too difficult. The foundation record would document the learner's goal (improve programming skill), context (limited time outside class), concern (recommendations may be poorly matched), and AI-specific need (an explanation of why an exercise was suggested and a way to request an easier or harder task). A corresponding design requirement could be: show the skill targeted by each recommendation, provide a brief rationale, and allow the learner to adjust difficulty. This is an illustrative scenario, not data collected from actual students.

C. Proposed Evaluation Plan

A future evaluation should involve at least two groups: novice persona creators and experienced AI product designers. Participants could complete the same persona-development task with and without the toolbox, using a consistent brief and comparable evidence. Measures may include task completion time, completeness of required persona fields, traceability of claims to evidence, inter-rater agreement on extracted user needs, perceived ease of use, and usefulness of the resulting personas for identifying interface requirements. Interviews after the task could reveal confusing instructions and missing templates.

Evaluation should also test the quality of the resulting design decisions, not just satisfaction with the templates. Independent reviewers could rate whether requirements are evidence-supported, relevant to user goals, attentive to trust and explanation needs, and explicit about human oversight. The study should report participant characteristics, recruitment method, protocol, limitations, and results transparently. Until such testing is completed, no numerical improvement or superiority claim is justified.

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VIII. LIMITATIONS

- **Lack of Empirical Evaluation:** The proposed framework has not yet been tested or evaluated through practical implementation within this manuscript**.**
- **Contextual Variability:** The framework's overall effectiveness may vary based on the specific application domain, risk level, available organisational resources, and access to representative users.
- **Potential for Administrative Burden:** The toolbox risk becoming burdensome and inefficient if development teams treat every single template field as mandatory regardless of the project's actual scope.
- **Future Testing Requirements:** Future work is necessary to test a minimum viable template set, compare alternative evidence-collection methods, and investigate how personas can stay current as AI models and workflows change.

IX. CONCLUSION

This paper has proposed a practical, open-source framework for developing personas that reflect the specific demands of human–AI interaction. In addition to conventional user characteristics, the framework records trust conditions, acceptance of AI support, explanation needs, expected control, and the consequences of incorrect outputs. Its five stages guide teams from stakeholder identification through evidence collection and analysis to persona documentation, visualisation, and validation.

The proposed evidence register and evidence-to-design mapping are intended to make persona claims easier to inspect and translate into interface requirements. The framework is a design proposal, not a validated product; its usefulness must be assessed through structured studies with real development teams and representative users. Future work should implement the repository, evaluate its usability, and adapt the materials for domains such as education, public services, healthcare, and software development. The long-term goal is to help teams build AI systems that are not only technically capable but also understandable, appropriately trusted, and responsive to the people who use them.

X. ACKNOWLEDGMENT

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