Independent University, Bangladesh
School of Engineering Technology and Science
Department of Computer Science and Engineering

PROJECT PROPOSAL FORM

SEMESTER: Autumn 2026

PROJECT TITLE: 2 MARKS

Pico: A Human-in-the-Loop Social Robot for AI Agents

Survey to develop a process for complex engineering problems considering cultural and societal factors (use pie chart): 5 MARKS

Problem: AI coding agents such as Claude Code and Codex can edit, run and delete code on a developer's computer. They stop to ask for permission, but the developer is often busy in another window, so requests are missed or approved without reading. Building a physical device that fixes this is a complex engineering problem: it mixes embedded hardware, networking, AI agent software and human behaviour. We follow this process, which brings cultural and societal factors in before design:

1. **Define the problem with stakeholders:** CSE students, freelancers and small software teams in Bangladesh who already use AI coding agents.
2. **Survey:** a 10-question Google Form in English and Bangla (3 sections: about you, current problems, Pico and local factors). Form: https://docs.google.com/forms/d/e/1FAIpQLScy3ZupUsSo8ZX-873TeFVTMxeApkPxnIAW4NZLN8K6pqkFbw/viewform
3. **Analyse cultural and societal factors:** cost of parts, power cuts and unstable Wi-Fi, shared and noisy workspaces, English language, and privacy and trust in AI.
4. **Turn findings into design rules:** locally available low-cost parts, works on local Wi-Fi without cloud services, short text with icons and faces, quiet sound modes, and the final decision always stays with the human.
5. **Prototype, test with users and iterate.**

Survey results (Q1–Q10)

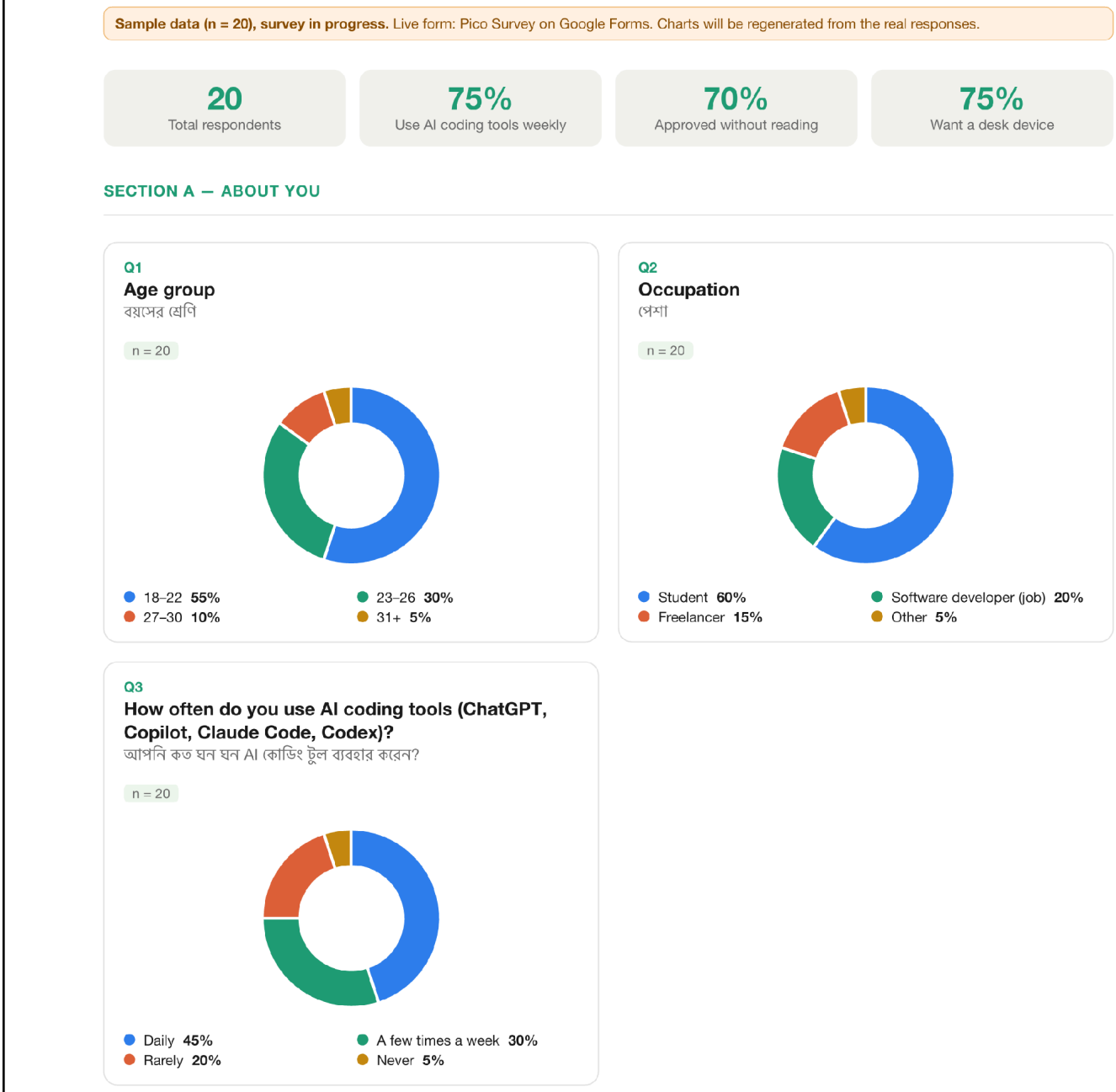

Figure 1a. Summary and Section A (about the respondents).

SECTION B — CURRENT PROBLEMS

Q4

Have you approved an AI-suggested command or code change without reading it fully?

আপনি কি কখনো পুরোটা না পড়েই AI-এর প্রস্তাবিত কমান্ড বা কোড অনুমোদন করেছেন?

n = 20



- Yes, often **30%**
- Sometimes **40%**
- Never **20%**
- Not sure **10%**

Q5

Do you miss AI agent requests while working in another window?

অন্য উইন্ডোতে কাজ করার সময় কি AI এজেন্টের অনুরোধ মিস করেন?

n = 20



- Yes **35%**
- Sometimes **40%**
- No **15%**
- I don't use agents **10%**

Q6

Biggest risk when an AI agent works on your computer

AI এজেন্ট আপনার কম্পিউটারে কাজ করলে সবচেয়ে বড় ঝুঁকি কোনটি?

n = 20



- Deleting or overwriting files **40%**
- Leaking private data **25%**
- Wrong code gets merged **20%**
- Internet and API cost **15%**

Figure 1b. Section B (current problems with AI coding agents).

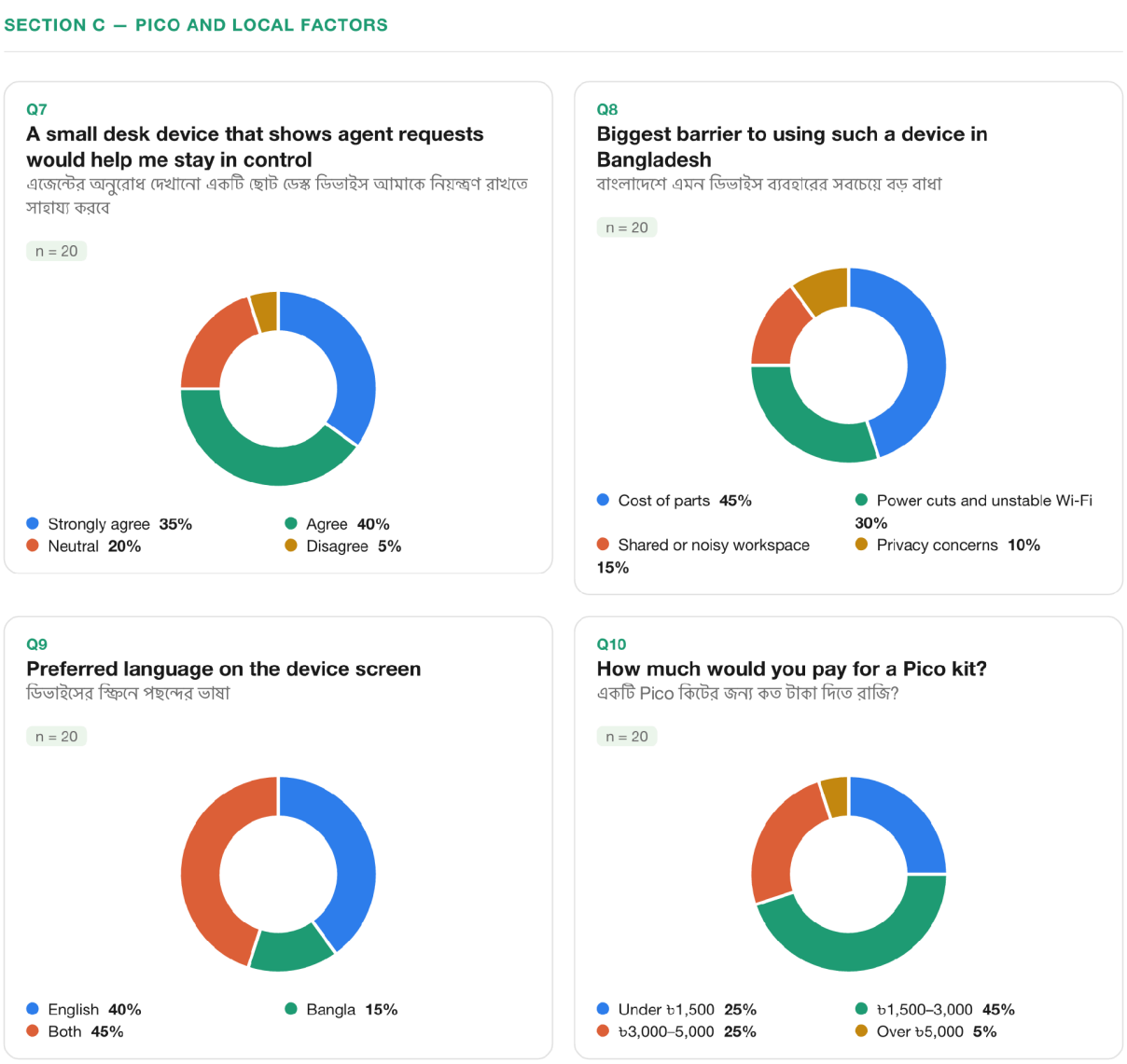

Figure 1c. Section C (Pico and local factors). Sample data, n = 20; charts are regenerated from the real form responses.

GOALS AND BENEFITS OF THE PROJECT: 3 MARKS

Goals

- Build a low-cost ESP32-S3 desk robot that shows AI coding agent permission requests and questions on a small screen, with animated faces and alert sounds.
- Let the user approve, reject or answer with physical buttons (OK, X and four arrows), sent back to the agent over Wi-Fi.
- Measure whether Pico shortens response time and reduces missed or careless approvals compared with answering in the terminal.

Benefits

- Safer AI agents: risky actions such as deleting files need a deliberate human press.
- Less context switching: developers keep working in other apps and still respond quickly.
- Affordable and open: built from parts sold in Bangladesh, with open-source hardware and software.
- Learning value: hands-on work in human-robot interaction, embedded systems and AI safety.

EXPERIMENTAL BLOCK DIAGRAM: 3 MARKS

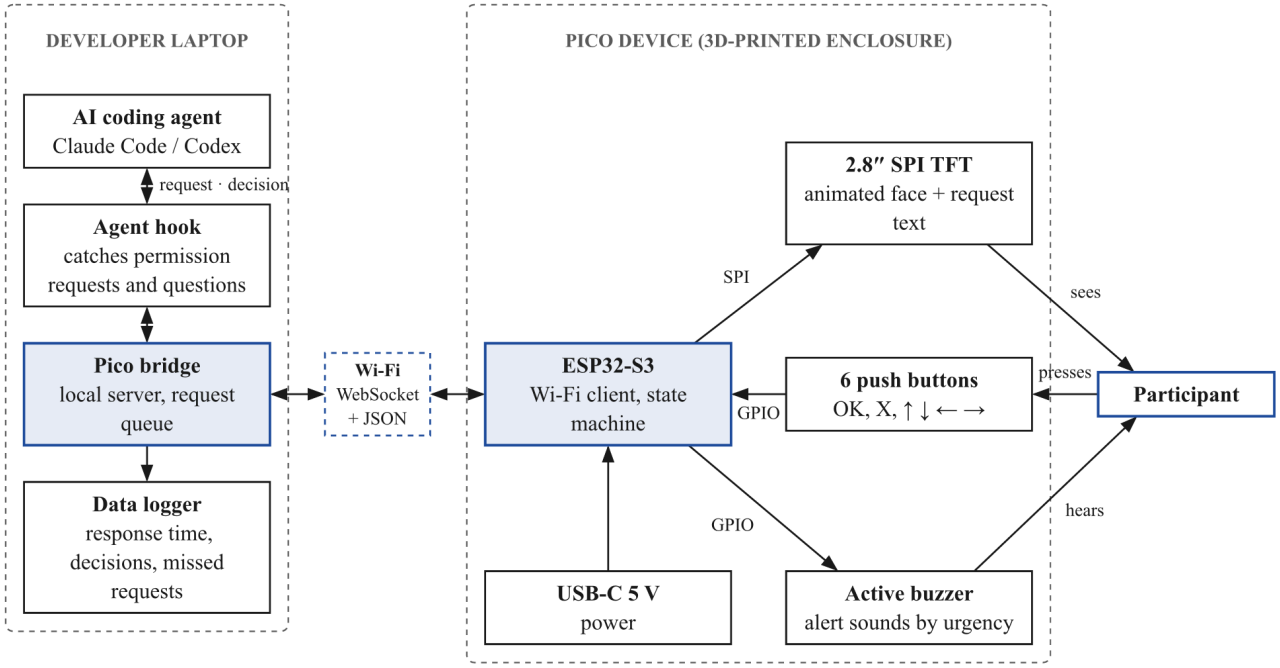

Figure 2. Experimental block diagram. The agent hook sends each request through the Pico bridge to the ESP32 over Wi-Fi; the participant answers with the buttons. The data logger records response time, decisions and missed requests, which are compared with a terminal-only baseline.

PROJECT TIMELINE (GANTT CHART): 5 MARKS

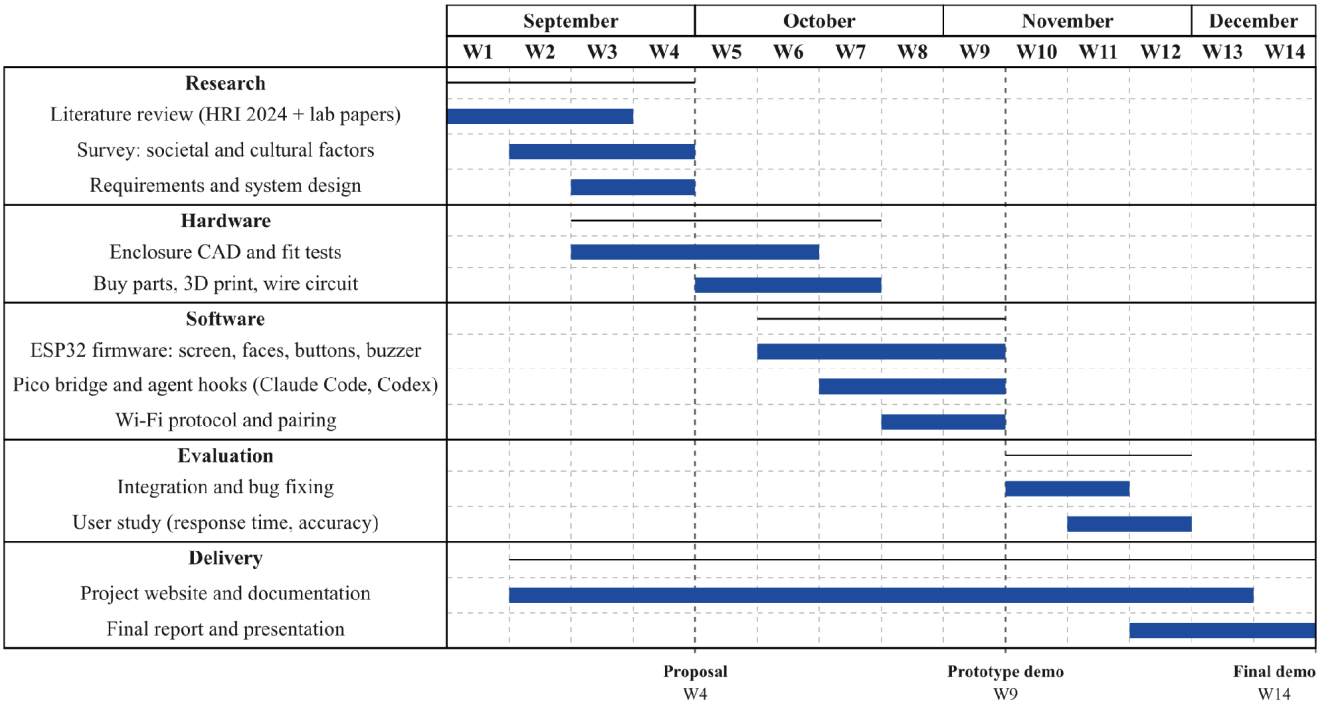

Figure 3. Project timeline for Autumn 2026 (14 weeks) with three milestones.

REFERENCES: (only references from recent paper publications are allowed, don't use you-tube, Wikipedia, or any random website for references): 2 marks

[1] A. Z. Ren et al., "Robots that ask for help: Uncertainty alignment for large language model planners," in Proc. Conf. Robot Learning (CoRL), PMLR vol. 229, pp. 661–682, 2023.

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[3] Y. Ruan et al., "Identifying the risks of LM agents with an LM-emulated sandbox," in Proc. Int. Conf. Learning Representations (ICLR), 2024.

[4] H. Mozannar et al., "Magentic-UI: Towards human-in-the-loop agentic systems," arXiv:2507.22358, 2025.

[5] L. Scherf, L. A. Gasche, E. Chemangui, and D. Koert, "Are you sure? Multi-modal human decision uncertainty detection in human-robot interaction," in Proc. ACM/IEEE Int. Conf. Human-Robot Interaction (HRI), 2024, doi: 10.1145/3610977.3634926.

[6] V. Chen, A. Zhu, S. Zhao, H. Mozannar, D. Sontag, and A. Talwalkar, "Need help? Designing proactive AI assistants for programming," in Proc. CHI Conf. Human Factors in Computing Systems, 2025, doi: 10.1145/3706598.3714002.

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[9] K. Mahadevan et al., "Generative expressive robot behaviors using large language models," in Proc. ACM/IEEE Int. Conf. Human-Robot Interaction (HRI), 2024, pp. 482–491, doi: 10.1145/3610977.3634999.

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COMMENTS BY COURSE TEACHER:

COURSE TEACHER'S NAMECOURSE TEACHER'S SIGNATUREDATE

GROUP MEMBERS

(Maximum 6 students are permitted to carry out a single Project. However, depending on the capability of the students, 4 number of students may be allowed but not less than that)

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REMARKS (for OFFICE use only)	

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