Xi'an Jiaotong-Liverpool University
西交利物浦大學

RDF-A

Appendix C

RDF Start-up Fund (RDF-A) Application Form

Bridging Artificial Intelligence with Professional Practice environment: a Digital Partner in the Design Process

(Research Proposal for XJTLU RDF-A)

Silvia Albano

Design School

Department of Architecture

Date: 01/09/2024

Basic Information			
A. Principal Investigator			
Name	Silvia Albano	School	Design School
		Department	Department of Architecture
Academic Degree	Master	Academic/Professional title	Assistant Professor (B)
Appointment Start Date	2021-08-17		
Main Research Field	Design Process, Artificial Intelligence (AI), Human-computer interaction (HCI), Life-long learning, Andragogy		
B. Project			
Type	☑ RDF Start-up Fund (RDF-A) ☐ Practice-Based Research Development Fund (PBRDF)		
Project Title	Bridging Artificial Intelligence with Professional Practice environment: a Digital Partner in the Design Process		
Project Title (in Chinese)	N/A		
Key words (maximum 5)	Artificial Intelligence, Professional practice, Digital Partner, Design Process, Human-computer interaction.		
Duration	01/2025-12/2027		
Total Funding Requested	RMB 99,000		
Resubmission or not	☑YES Ref_No(resubmission): RDF-23-02-078 ☐NO		

N.B. Please respect word limit and provide the word count at the bottom of each section. Please don't add appendices.

Abstract (up to 150 words)

Please write an Abstract of the proposed research project in **non-specialist language (i.e. comprehensible to someone outside your field)** to allow review panel members or other colleagues to understand your project easily.

The proposed research project seeks to redefine the architecture design process by integrating Artificial Intelligence (AI) as a digital partner, moving beyond its role as a mere tool. This innovative approach envisions architects and AI collaborating as co-creators, where AI's analytical capabilities and data processing complement the creative and critical thinking skills of human designers. The research aims to enhance workflow efficiency and creativity through this symbiotic relationship (Amershi et al. 2019; Li et al., 2024; McComb et al. 2023; Naser et al., 2023). By examining the entire design process, the study will explore how AI can contribute possibly to each phase, from conceptualization to execution, and address the challenges and opportunities this integration presents. Employing a mixed-

method approach, including literature review, expert interviews, case studies, participatory design workshops, and surveys, the research intends to develop a new design methodology that optimizes human-computer interaction for collaborative creation (Marri, S., 2023; Yuan, P.F., 2023). This methodology will aim to improve design outcomes but also ensure that AI's integration is ethical, transparent, and free from bias.

/Users/silvia.albano/Desktop/Picture1.jpg

Figure 1. Visual representation realized by the author using DALL*E for introducing the key point to this proposal.

“Dynamic interaction and mutual exchange of ideas between Architects and AI in a collaborative and innovative design studio environment where AI is considered a digital colleague.”

1. Background (up to 350 words)

The integration of artificial intelligence (AI) in Design practices is increasingly focused on enhancing the management of the design process and fostering a new type of interaction between AI and architects (Yu at al., 2024). **Human-AI interactions** can be re-shaped considering AI as a **digital partner** and a member of the design team rather than a tool (Rezwana et al., 2023). AI technologies are being leveraged to augment the creative capabilities of designers, streamline design workflows, and facilitate more dynamic interrelationships between humans and machines. One significant development is the emergence of AI-driven design tools that assist architects as well as design students in generating and exploring design alternatives (Cheung et al., 2024; Dall'Asta et al., 2023; Camburn et al., 2020). Recent literature suggests a shift towards collaborative co-creation between architects and AI systems (Dai et al., 2023; Simeone et al., 2022; Thoring et al., 2023; Tsiakas et al. 2024). This approach involves practitioners and AI working together in a symbiotic relationship, where each contributes unique strengths to the design process without bias, like in a professional environment where each team member cooperates in developing a design proposal. AI systems assist professionals in generating design alternatives, analyzing data, and providing insights, while designers provide domain expertise, creative input, and critical judgment to be shared (Candy & Dunagan, 2017; Yang et al., 2021; Serra & Miralles, 2021; Sharma & Jha, 2021; Singh & Gu, 2012; Zhang et al., 2021). Furthermore, there is a focus on enabling real-time feedback and iterative design refinement in human-AI interactions. Architects can interact with AI systems to receive immediate feedback on design proposals, explore alternative design options, and iteratively refine solutions based on evolving project requirements and stakeholder feedback. Real-time feedback mechanisms facilitate agile and responsive design processes, leading to more adaptive and resilient architectural solutions (Baxter, 2017; Hwang et al., 2020; Lan et al., 2020; Li et al., 2021). Moreover, novel literature highlights the importance of addressing ethical and social considerations in human-AI interactions within professional practice. This aspect includes ensuring fairness, transparency, and accountability in AI decision-making processes, as well as addressing potential biases and unintended consequences of AI-driven design solutions (Costa & Stelzer, 2020; Shin & Ryu, 2021). By considering these current trends and directions in human-AI interactions, architects can leverage AI as a valuable digital partner in the design team, enhancing creativity, efficiency, and innovation in design practice.

Word count: 341

2. Aims and Objectives (up to 100 words)

The aim of this research is to redefine the **professional practice workflow** in architecture, as outlined in the RIBA Plan of Work, by integrating a framework that positions Artificial Intelligence as a **Digital Partner**. Through collaboration with practitioners and AI experts, such as PromeAI—a cutting-edge startup focused on R&D in computer vision and language models—the researcher seeks to develop a design methodology where architects and AI

collaborate as team members. AI will contribute to all phases of the design process, enhancing creativity and supporting decision-making within this collaborative environment.

Word count: 92

3. Research Question(s) and Methodology (up to 500 words)

Outline the research question(s) to be addressed, as well as their importance. Detail the methodologies relied upon to answer these questions.

This proposal intends to address the following research questions:

1. How can Artificial Intelligence (AI) be effectively integrated into the design process as a digital partner, enhancing workflow efficiency and creativity?
2. What specific challenges and opportunities does AI present in the different phases of the design process?
3. What are the best practices and strategies for implementing AI as a digital partner in design decision-making process?

Methodology:

To address these questions, a mixed-method approach combining qualitative and quantitative techniques will be employed. This approach will be developed in collaboration with Dr. Na Li from the Academy of Future Education, as co-investigator, ensuring that the methodology aligns with **andragogical principles**. These principles emphasize the importance of designing learning experiences that are experience-based, problem-centered, and internally motivated for adult learners. The methodology will consist of the following steps:

1. **Literature Review:** A thorough review of existing literature on AI applications in architecture, human-computer interaction (HCI), and current design methodologies will be conducted. This review will establish the theoretical foundation for the new framework aimed at enhancing AI integration in the design process.
2. **Expert Interviews:** In-depth interviews will be conducted with leading architects, design theorists, and AI experts, including representatives from PromeAI, a startup specializing in computer vision and language models. These interviews will provide insights into the current state and future potential of AI as a collaborative partner in architectural practice.
3. **Case Studies:** Detailed case studies will be conducted on selected architectural firms that have integrated AI into their design processes. These studies will examine the challenges, opportunities, and outcomes of AI integration, offering a comprehensive overview of the current state of AI in architectural practice.
4. **Experimental Testing Sessions / Participatory Design Workshops:**

These activities will be organized with practicing architects and students to collaboratively explore and refine the new design methodology that integrates AI as a Digital Partner. These sessions tests the proposed methodology in real-time scenarios. These sessions will involve experimentation to assess the practical effectiveness of AI integration, allowing for iterative refinement based on the outcomes. The aim is to ensure that the new design approaches are not only theoretically sound but also practically feasible and innovative.

5. **Surveys and Questionnaires:** Surveys and questionnaires will be distributed to a broad sample of professionals to gather quantitative data on their attitudes, preferences, and

experiences with AI in the design process. The same questions will be formulated to research assistants and AI systems to create a **collaborative environment** that respects the perspectives of all participants, including AI. This approach reinforces the creation of a learning environment grounded in andragogical principles, such as experience-based and problem-centered learning.

6. **Data Analysis and Synthesis:** The collected data from interviews, case studies, workshops, and surveys will be analyzed using qualitative and quantitative methods to identify patterns, trends, and insights. This analysis will support the development of the new design methodology that integrates AI as a collaborative Digital Partner in design disciplines.

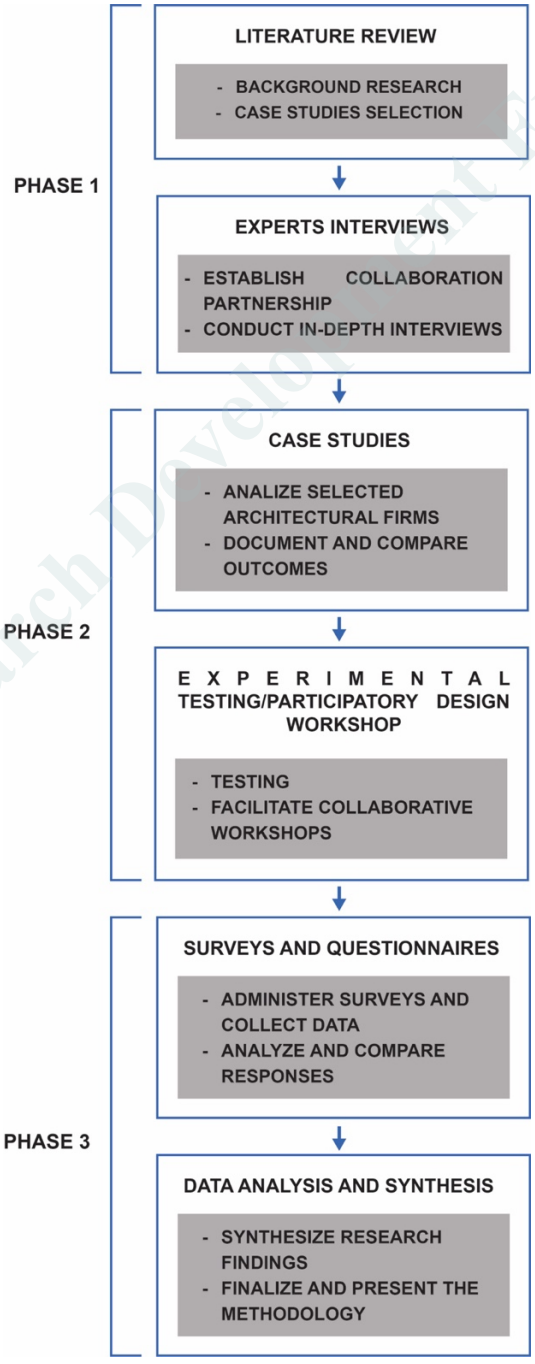

Figure 2. Research Project Methodology Flowchart with sub-tasks

Word count: 490

4. Feasibility Analysis (up to 250 words)

Present a feasibility analysis in terms of your experience and expertise, resources required etc. Where necessary, identify potential constraints to success of the project and propose strategies to circumvent them.

The proponent of this research has two years of experience studying and applying AI in the design process. The ongoing collaboration with Dr. Na Li will help further analyzing AI's effectiveness in both architecture and educational context. This expertise, developed through workshops, a design-to-build project with architecture students, and international conference presentations, reinforces the proposal's aim to explore AI as a partner in the design process of architectural projects. The proposal mainly involves cooperating with professional practices within the already existing network of architects locally (Suzhou/Shanghai) and globally (Europe, US, Middle East) of the researcher. By comparing design projects conducted with and without AI the study intends to foster the exchange of ideas and strategies, real-time feedback and interactive exchange positioning AI as an active collaborator. Furthermore, the project is supported and promoted by PromeAI (https://www.promeai.pro), AI leading company, the researcher is collaborating with.

While recognizing challenges such as understanding market trends and professional needs, the proposal views these as opportunities to cultivate an entrepreneurial spirit within the design field, enhancing employability and creating a strong link between higher education, industry, and professional practice.

Word count: 184

5. Work Plan and Timeline (up to 200 words)

The Work Plan for this research project is structured into three phases over a three-year span. **Phase 1: Desk-Based Research and "Meet the Practice"** involves a thorough analysis of design precedents and literature to establish AI as a digital partner in the design process. Professional practices in China and abroad will be selected as collaborators, and expert interviews will be conducted. **Phase 2: Implementation, AI as a Digital Partner** is the core phase, focusing on AI integration. Detailed case studies, experimental testing sessions, and participatory design workshops will be conducted. AI will collaborate with architects to generate design alternatives, analyze data, and provide real-time recommendations, evolving into an adaptive partner. The recruitment of RAs before Phase 2 will be instrumental in forming teams working on shared projects and organizing the working schedule. **Phase 3: Findings and Conclusions** involves synthesizing research findings and finalizing the AI-integrated design methodology. Surveys and questionnaires will gather feedback, and results will be analyzed to refine the strategy. The research will

conclude with presenting the final methodology and recommendations to participating companies, with dissemination through international publications, exhibitions, working platforms, and digital media contexts. Word count: 188

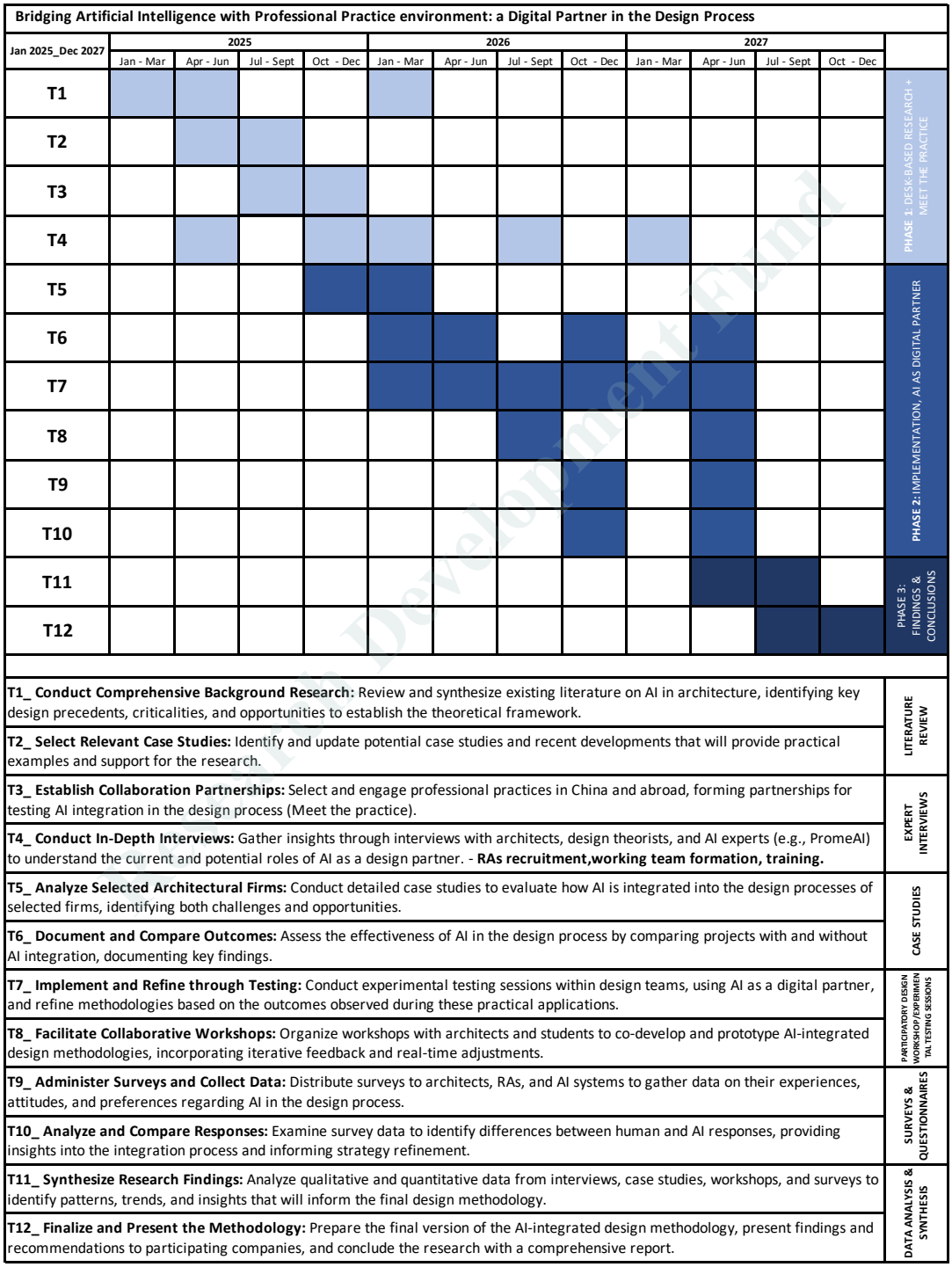

Figure 3. Detailed projected three-year timeline

6. Potential Value and Impact (up to 100 words)

This research proposal highlights the transformative potential of Artificial Intelligence (AI) in architectural design, aligning with the **4th UN Sustainable Development Goal** on quality education and **XJTLU's strategic vision for AI integration**. By positioning AI as a digital partner, the project aims to revolutionize design by enhancing creativity, efficiency, and inclusivity. It bridges academia and industry, fostering a forward-thinking approach to pedagogy and andragogy, preparing students and professionals with critical skills in digital literacy and sustainable development. Demonstrating AI's role in professional practices, the project will drive innovation, supporting the industry's transition to advanced, AI-integrated methodologies.

Word count: 96

7. Expected Research Outcomes and Milestones (up to 200 words)

Describe the expected research outcomes related to this project. Please also provide the number of expected outcomes in the table below.

The primary research outcome of this research is to assess how effectively AI can be considered as a Digital Partner within design teams, evolving beyond its traditional role as a tool. This approach positions AI as an active collaborator, contributing ideas, insights, and expertise throughout the design process, from initial briefing and conceptualization to operational phases, in alignment with the RIBA Plan of Work.

Expected Research Outcomes:

1. **Comprehensive Understanding**: Develop a deep understanding of AI integration in the design process, with findings presented at international conferences and exhibitions, such as IDI – Italian Design Icons in China interested about AI dissemination; and through PromeAI-hosted virtual events.

2. **Challenges and Opportunities**: Identify and analyze key challenges and opportunities for AI in design practice, informed by expert insights and case studies, with results disseminated via academic publications and PromeAI's digital channels.

3. **New Design Methodology**: Create and refine a design methodology that integrates AI as a Digital Partner, validated through practitioner feedback and comparative project analysis, to be published as a book chapter.

4. **Data-Driven Insights**: Collect and analyze data on the experimentation with AI done in the project, with outcomes published in leading academic and professional journals. To ensure broad dissemination across academia, industry, and stakeholders, results will be shared via a dedicated website (PromeAI), digital exhibitions, and participatory workshops.

	Total Number		Number	Note
Publication	5	Journal Paper	2	1. Computers & Education Journal

				2. SSCI Journal
		Conference Paper	2	CAADRIA, eCAADe, IHIET
		Other (e.g. book, chapter, monograph)	1	
Intellectual Property	N/A	Invention	N/A	
		Utility Model	N/A	
		Design Patent	N/A	
		Software Copyright	N/A	
Others (e.g. social Impact, host events)	Social and professional impact: - PromeAI live webinar series; - PromeAI virtual community digital channel; - IDI – Italian Design Icon International exhibition and talk; - digital exhibitions on Companies websites and the University platform. Host events: - Participatory Design Workshop			
What external funding will you attempt to seek?	- UKRI Challenge Fund for Research and Innovation / Creative Industries - Industry Academic Research Fun CDEL			

Word count: 219

8. References

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9.Budget

Please summarise the anticipated costs in the table below and provide a justification for each specific budget sub-category. **Please refer to Appendix B Guideline on the project budgeting**.

Budget Items: *(Please add items to the following 3 categories.)*

Categories	Amount (RMB)	Justification
Equipment Expenses	11,568	AI software subscriptions (PromeAI): Only full licenses for professional use could sustain the expected research outcomes, milestones, and potential impact on the existing body of knowledge in the field, avoiding the limitations of using sources/free trials as the researcher already experienced in the last two years of experimentation during workshops and design-to-built project. Using a full package software is a condition to build an effective collaboration with professional praxis and academia connecting design studios, AI, and stakeholders in a new manner.
Operational Expenses	4,232	1. Domestic travel Suzhou to Shanghai: Another activity of the phase one of the project is based on meeting the professional firms and AI experts: 1-2 persons of XJTLU team, for in-depth interviews conducted with leading architects, design theorists, and AI experts to gather their insights on the current state and future potential of AI in architectural practice as design partner (travel to Shanghai for meeting selected Professional Practices and AI experts, 4232,00 RMB). As requested in the comment received in September 19th from the system, here below a simple calculation basis of travel costs adjusted as per travel policy with SECOND CLASS FOR TRAIN and traffic by ACTUAL EXPENSES as per TRAVEL policy. The sources used is TRIP.com: - Suzhou (Suzhou Industrial Park) / Shanghai (SH Central), a/r (2ND class) 62 rmb x 2 people x 18 trips in 3 years = 2232 rmb (NB. The trips include visiting the selected Companies and the PromeAI Headquarter). - local traffic expenses (Didi, Cao Cao) for reaching the train stations in Suzhou and Shanghai and the Companies locations, total

		2000 rmb
Labour Expenses	83,200	The recruitment of RAs [1 undergraduate student (24.00 rmb x 8 hours x 5 days x 10 weeks x 1 UG student = 9600 rmb), 2 postgraduate students (50.00 rmb x 8 h x 5 d x 10 w x 2 PG students = 40000 rmb) and 1 PhD student (60.00 rmb x 8 h x 5 d x 10 w x 1 PHD student = 24000 rmb) and 1 senior academic professional (2400 rmb/day for senior academic/professional x 4 times = 9600 rmb)] will become instrumental in forming teams for working on shared projects by the selected companies (phase 2). This is the core moment that aims to create a new working framework where AI can be considered a Digital Partner (experimentation) and to question the role of AI in the design process from ideation to production.
Total amount:	**99,000RMB**	

10. Ethical Requirements of Research Project Involving Human and Animals

10. 1. Will the proposed research involve human genetic resources, including the materials of human genetic resources and information on human genetic resources?

☑ NO

☐ YES - please provide a brief description of the ethical implications and the measures that will be taken to ensure that adequate protections are in place.

IMPLICATIONS:

PROTECTIONS:

10. 2. Will the proposed research involve animals?

☑ **NO**

☐ **YES - please provide a brief description of the ethical implications and the measures that will be taken to ensure that adequate protections are in place.**

IMPLICATIONS:

PROTECTIONS:

10. 3 Will the proposed research involve human participants, survey respondent or personal data?

☐ **NO**

☑ **YES - please provide a brief description of the ethical implications and the measures that will be taken to ensure that adequate protections are in place.**

IMPLICATIONS:

The purpose of the surveys and questionnaire interviews conducted with leading architects, design theorists, and AI experts is to gather insights on the current state and future potential of AI as a design partner in architectural practice. By understanding practitioners' attitudes, preferences, and experiences with AI in the design process, we aim to define a new design methodology that integrates AI as a Digital Partner. This methodology will be tested and refined through practitioner feedback and the comparison of design projects completed with and without the application of this proposed approach.

PROTECTIONS:

All collected data will be anonymized and securely stored on a hard drive for use in this project and future research. Only the researchers will have access to the original data, which will be retained for six years. No personal information will be collected; only the participants' reflections and considerations, which will be anonymized to protect their identities.