

INTRODUCTION

Smart Product-Service Systems (S-PSS) integrate intelligent products with digital capabilities, presenting a transformative business models. This study addresses the challenge of optimizing user experiences within S-PSS, emphasizing context-awareness.

The proposed framework combines ontologies and context-aware recommendation systems, utilizing user interactions for adaptive user interfaces. Two case studies showcase the practical application in a smart device app and an industrial scenario, demonstrating effectiveness.

Evaluation results highlight the improved precision of context-aware recommendations and positive impacts on UX aspects like usefulness and system efficiency, emphasizing the framework practicality and benefits.

OBJECTIVES

1.Data-Driven User Experience Enhancement:

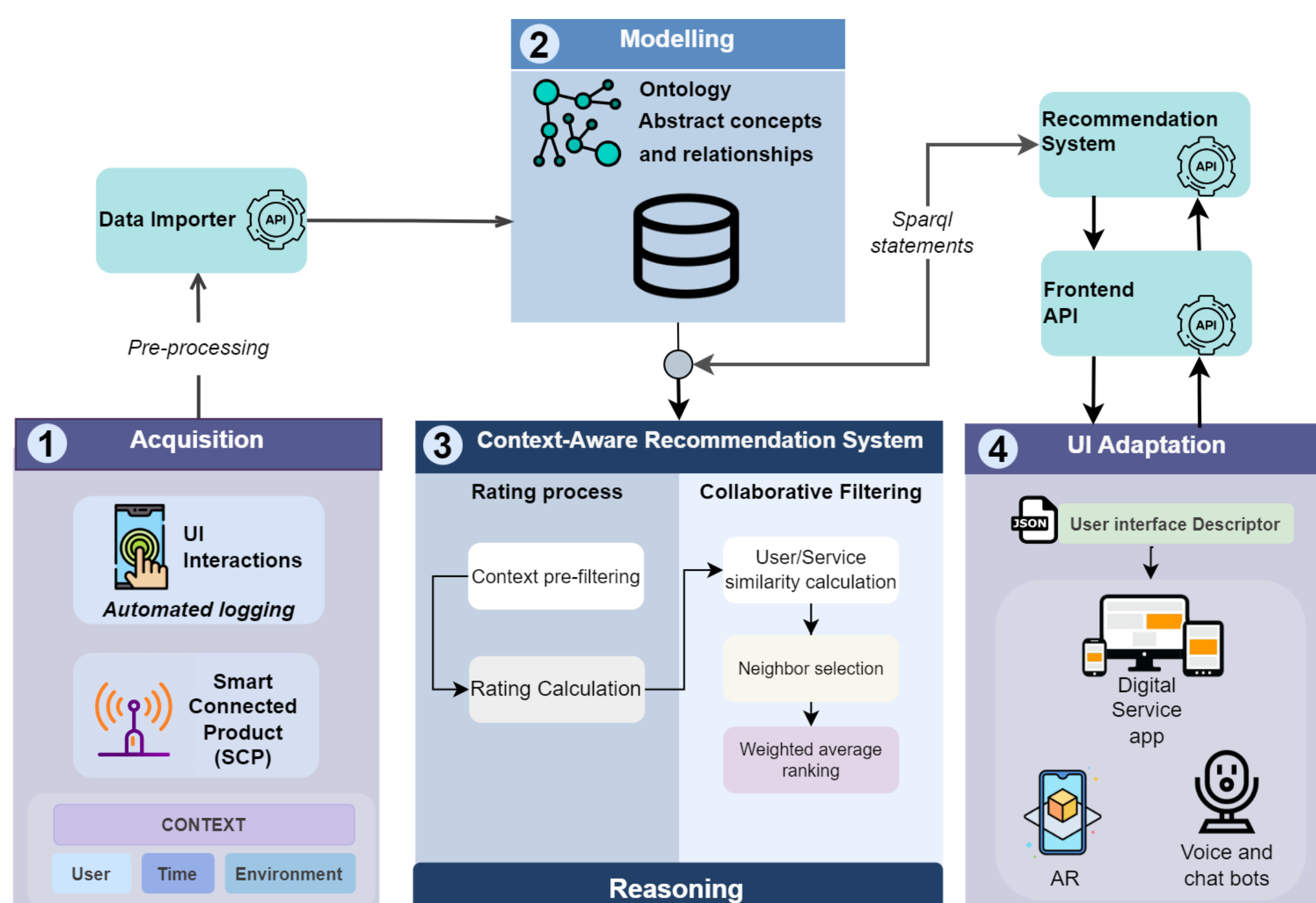
Develop and implement strategies to exploit internal data sources within Smart Product-Service Systems (S-PSS), focusing on transforming users into active "experience creators" through real-time user data.

2.Real-Time User Interface Adaptation Framework:

Propose and validate a framework for real-time user interface adaptation in S-PSS, aiming to dynamically respond to individual user needs during the 'usage' stage, ultimately enhancing overall user experiences.

FRAMEWORK OVERVIEW

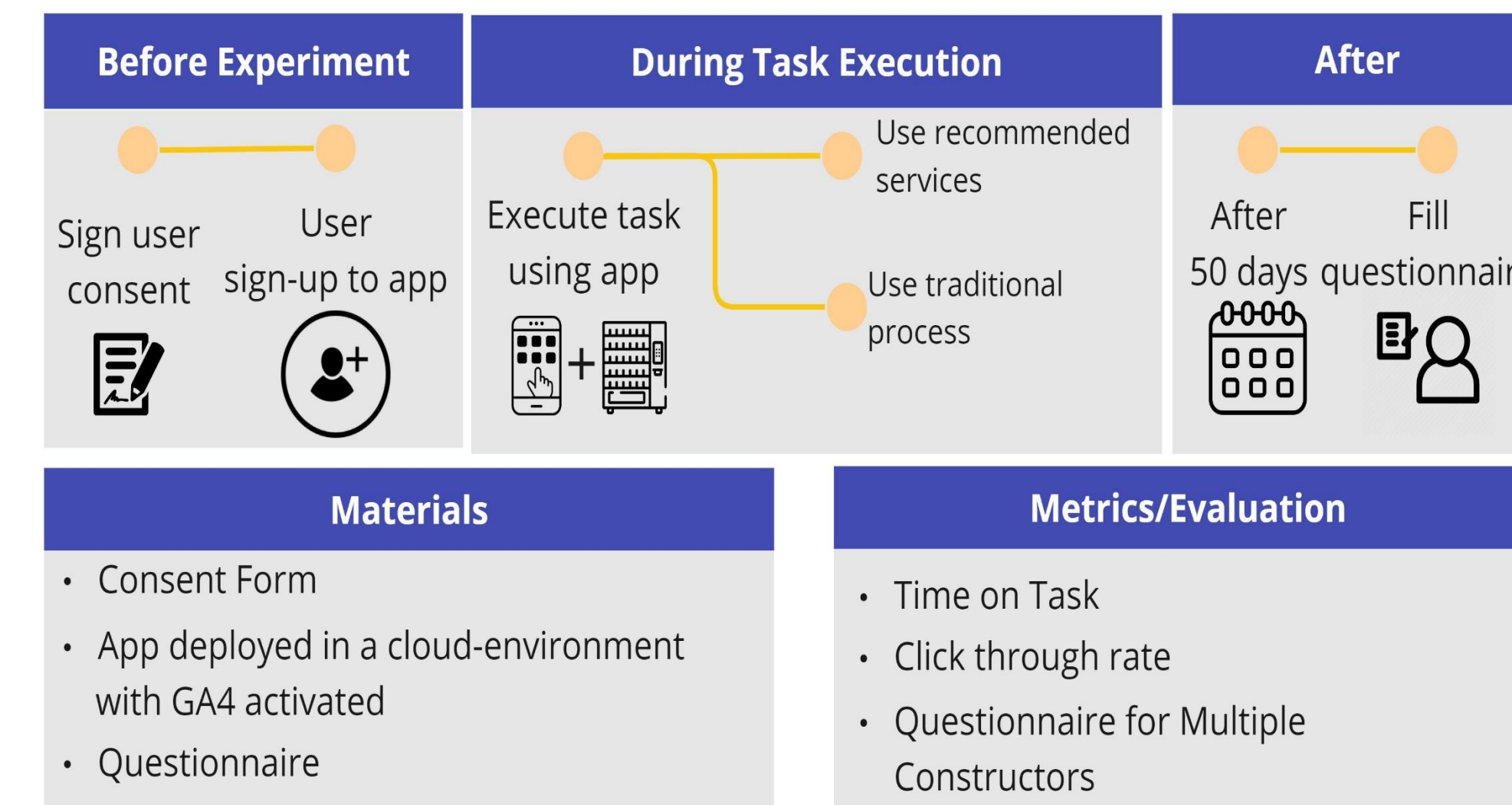
This research introduces a framework designed to organize and guide system development, focusing on UI adaptation within Smart Product-Service Systems (S-PSS). The framework encompasses Acquisition, where user interactions are key data sources; Modelling, where collected data is structured; Reasoning, processing data to enhance user experience; and UI Adaptation, generating the user interface based on recommendation engine results. The framework provides predefined components and guidelines, offering a structured approach to system development.



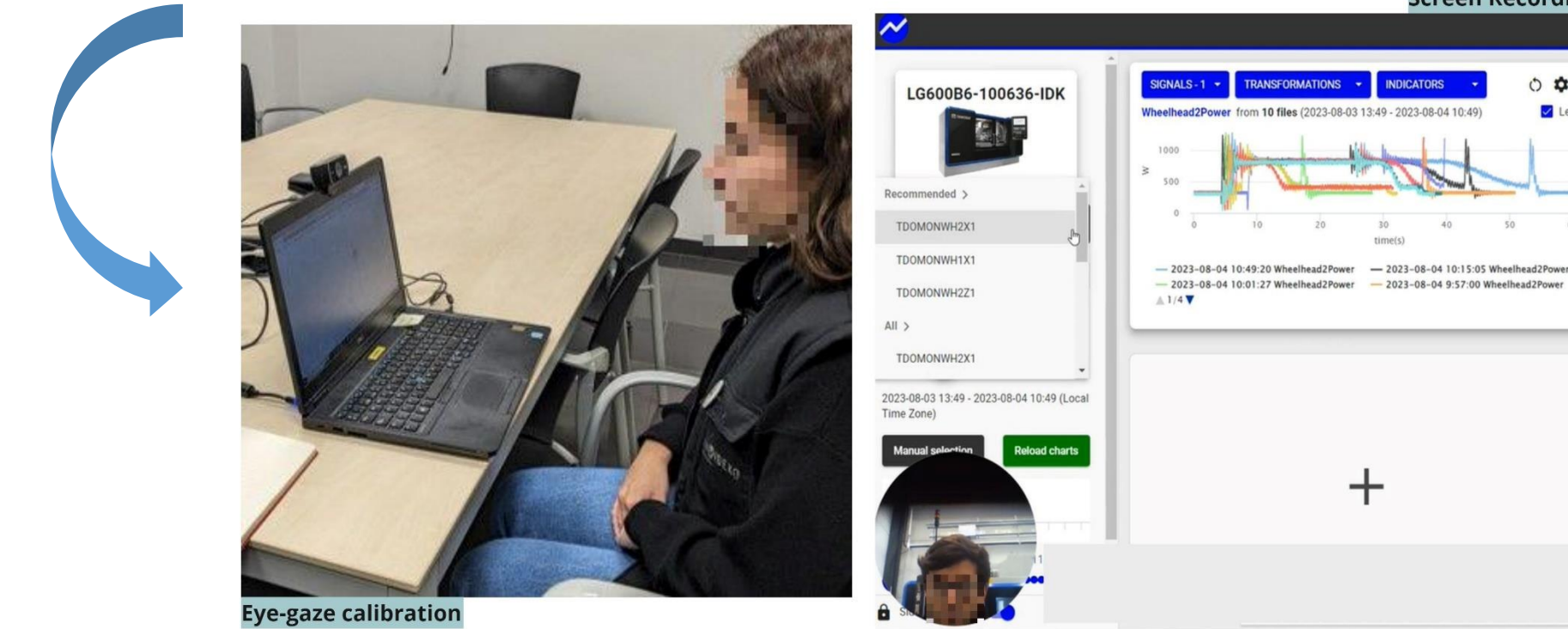
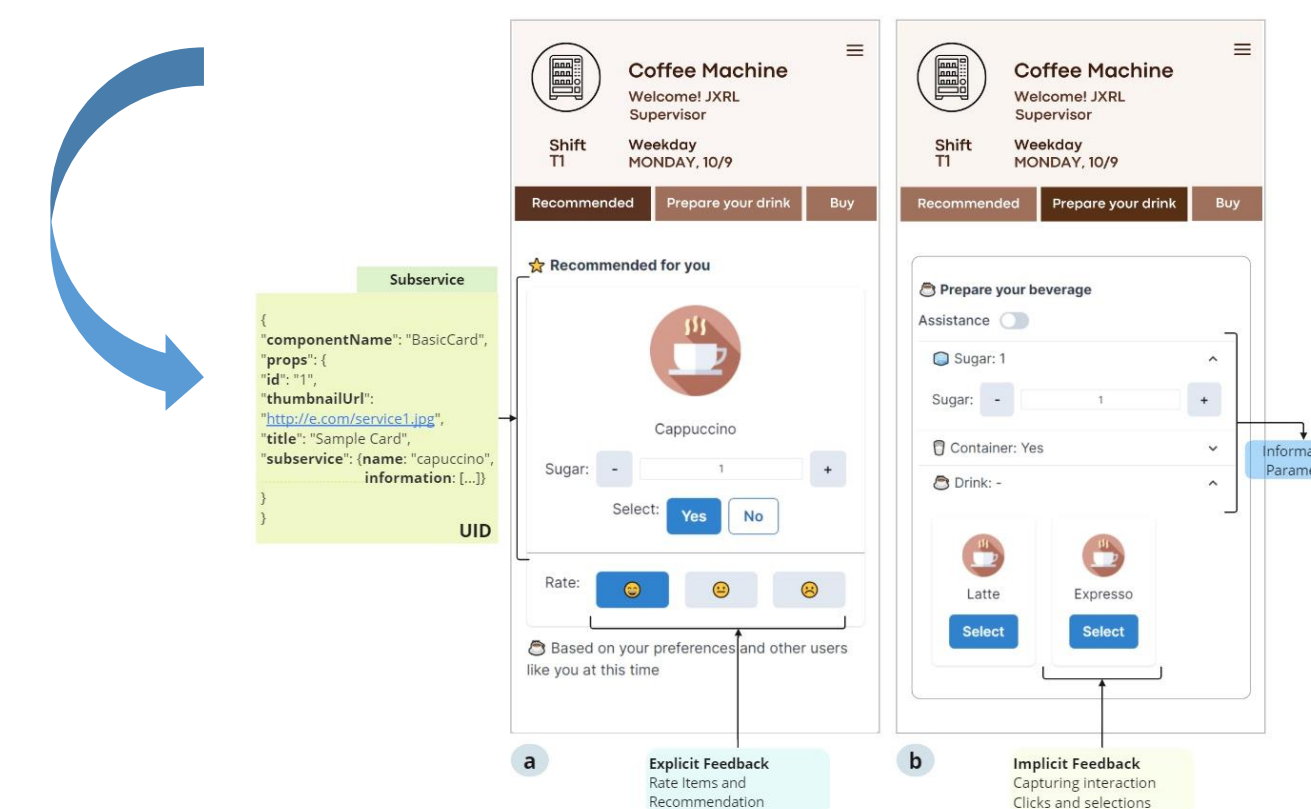
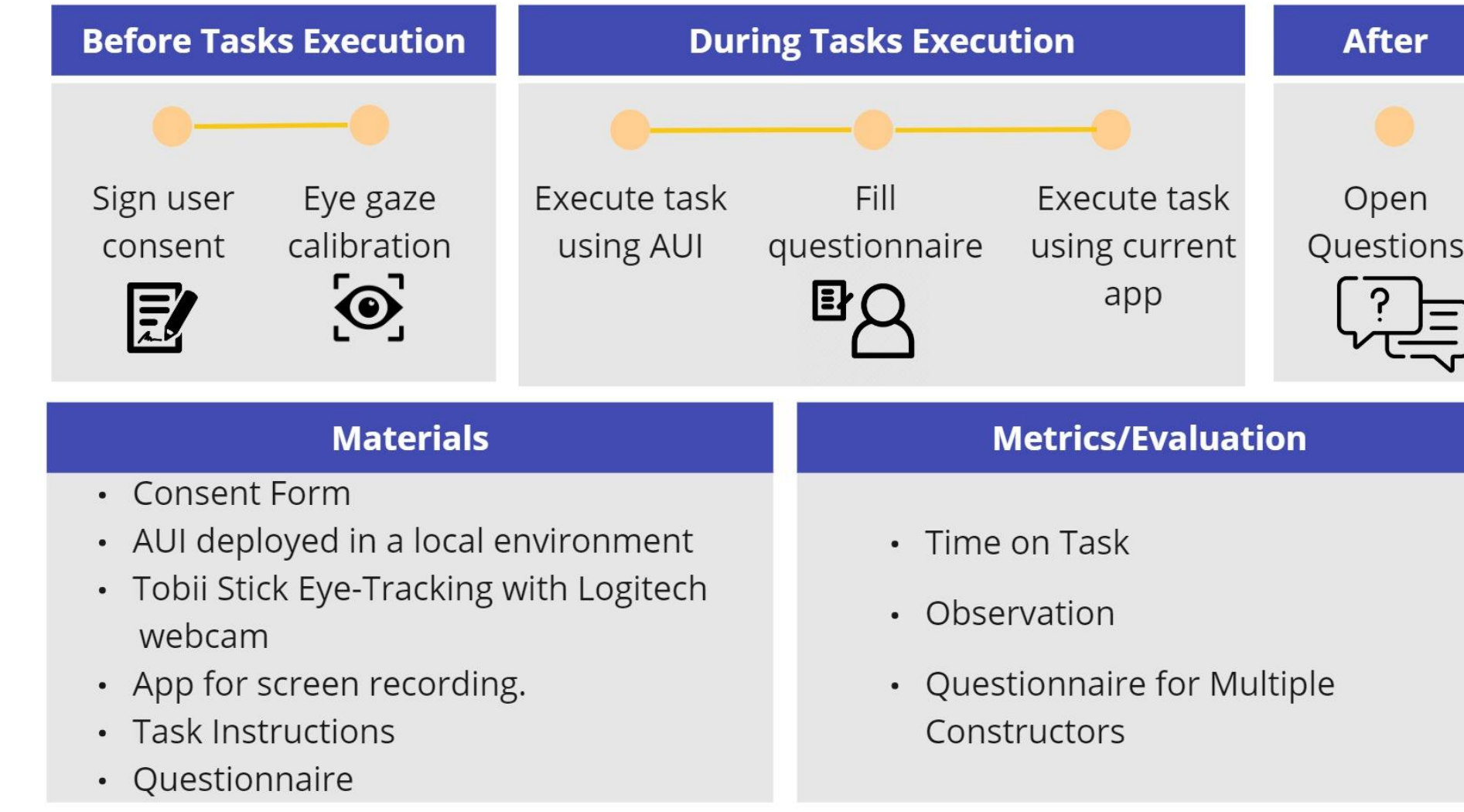
RESEARCH METHODS

Utilizing case studies, this research assesses the practical application and effectiveness of the proposed framework. The protocol followed by the case studies are described below:

CASE STUDY 1: SMART VENDING MACHINE

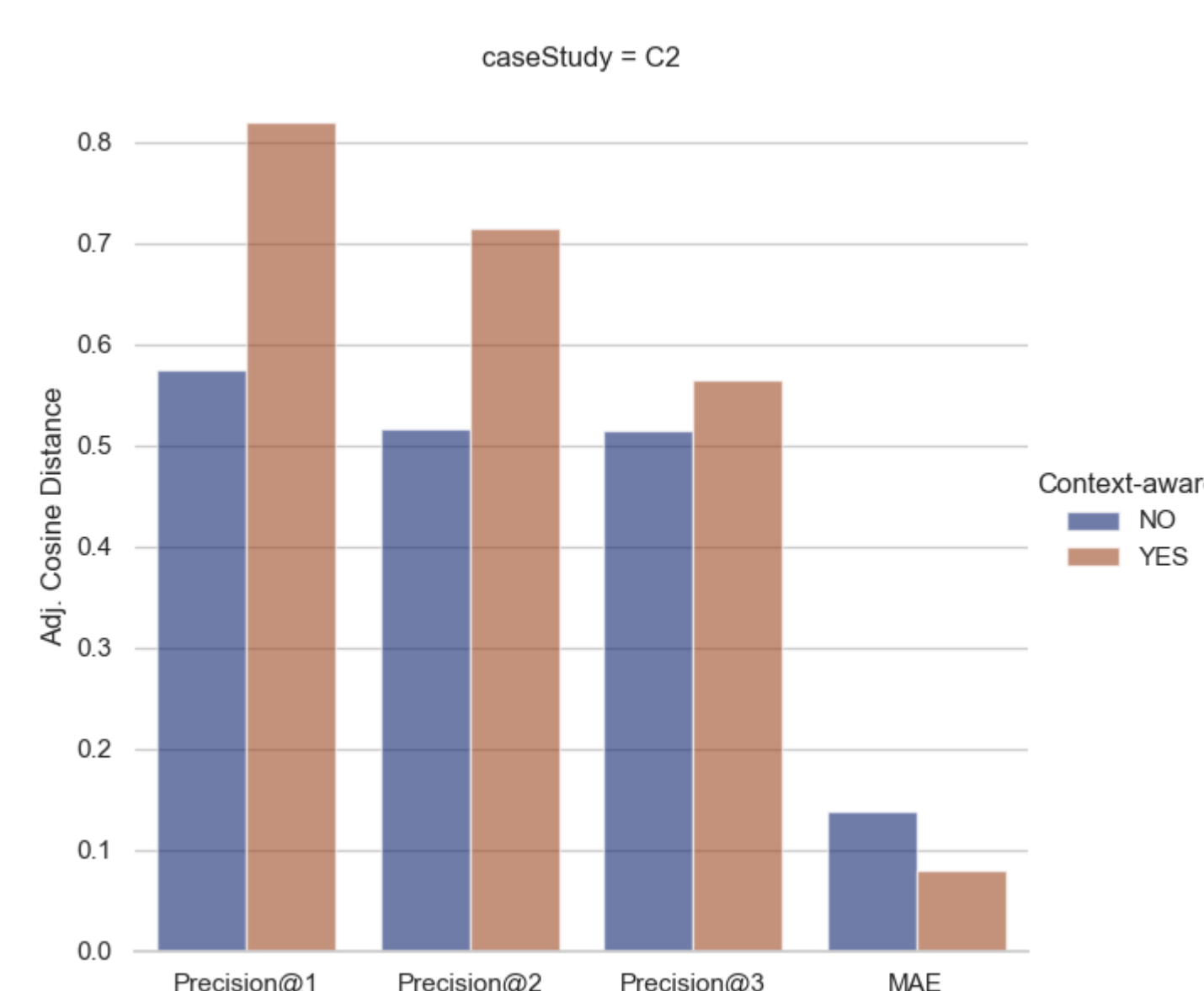
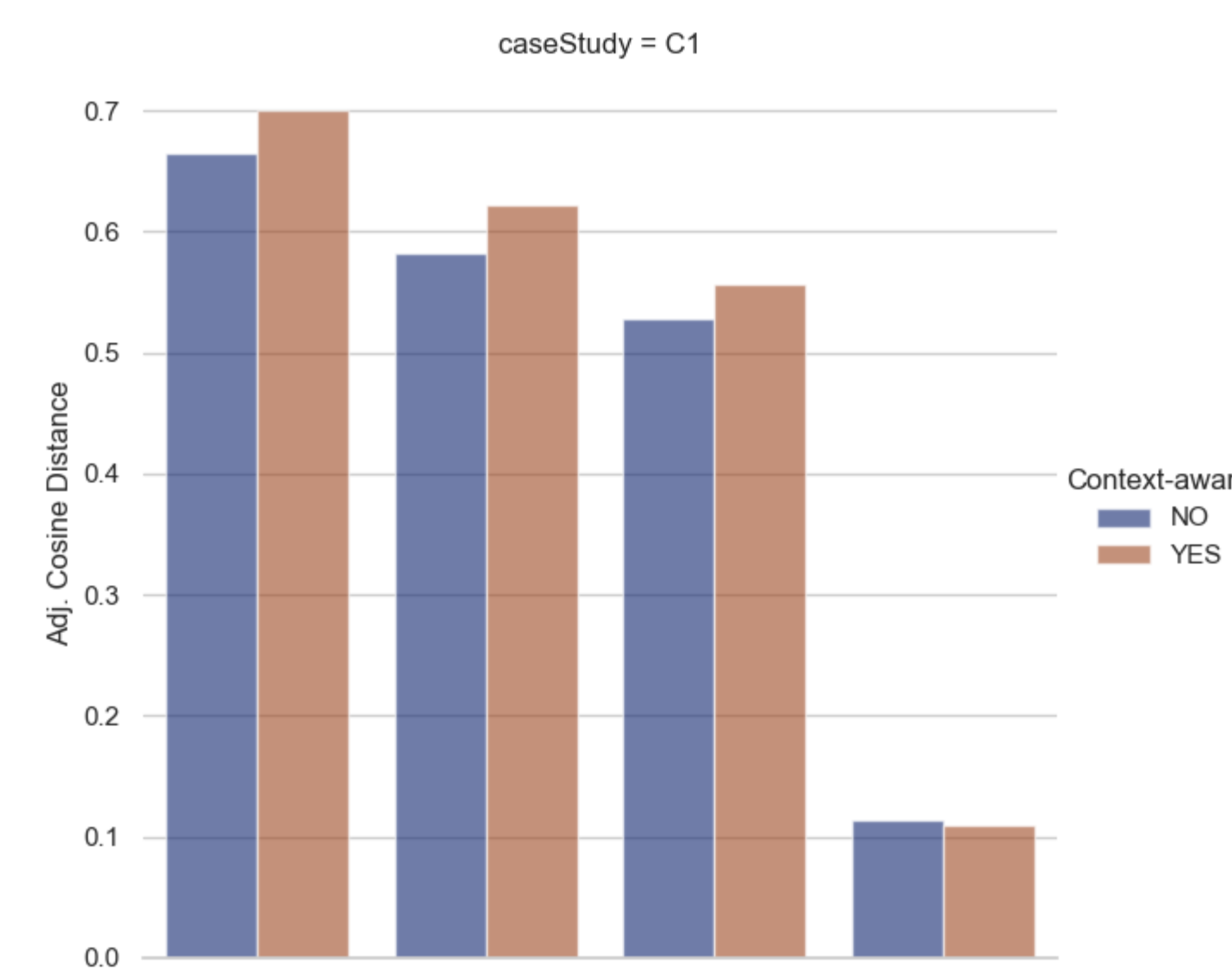


CASE STUDY 2: GRINDING MACHINE MONITORING SERVICE

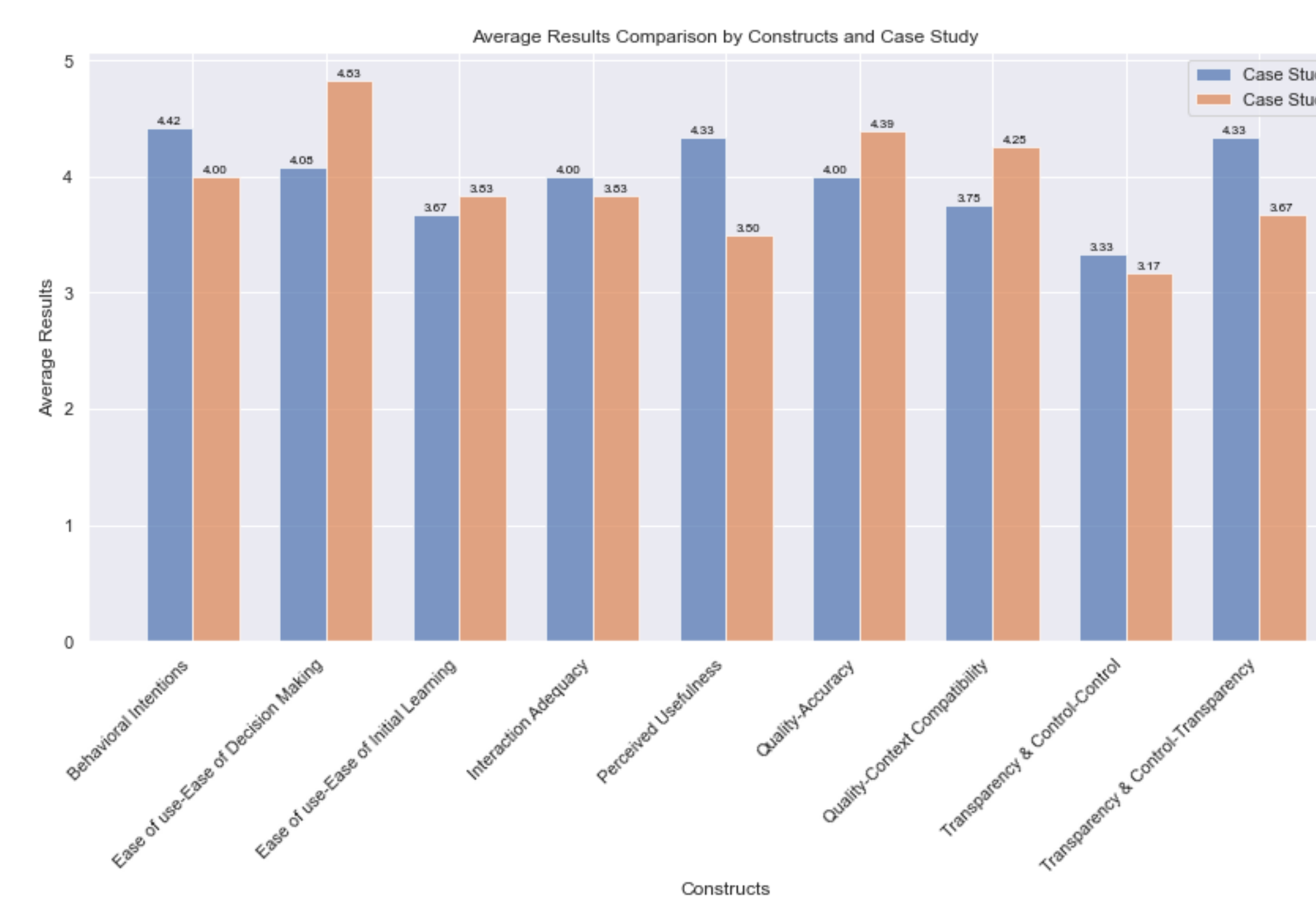


RESULTS: CASE STUDIES

Offline Evaluation: assesses recommendation algorithm effectiveness using historical data



UX Evaluation: Using a questionnaire with several UX constructs



Online Evaluation: assesses recommendation system performance with real-time user interactions.

Metric	Result
$CTR = \frac{\text{Total Number of Acceptances}}{\text{Total Number of Sequences}}$	0.6913
$Avg. Time-on-Task = \frac{TT_1+TT_2+\dots+TT_n}{n}$	00:49 seconds (accepted) 01:44 seconds (rejected)

CONCLUSIONS

Framework Development: The study introduced a robust development approach for adaptive user interfaces within the S-PSS environment, leveraging a carefully structured framework. This framework served as a guide for system development, emphasizing the exploitation of user interactions with digital services and contextual data.

Main Contributions and Impact: A significant contribution of this work is the integration of diverse components to create Adaptive User Interfaces for digital services. The hands-on case study demonstrated the practical implementation, showcasing an improved precision of recommendations through a context-aware approach.

UX Findings and Interface Design: The research explored various aspects of UX, including user performance, usability, engagement, and satisfaction. Positive effects on user efficiency and ease of decision-making were observed, with the UI generated using the framework, users saved time and increased confidence in their choices. The study highlighted the importance of an intuitive interface, emphasizing readability, clarity, and visual elements to enhance overall user satisfaction and usability.

Limitations, Future Research, and Conclusion: Acknowledged limitations, including users' preference for familiarity and technological constraints. Proposed future research directions encompass exploring user preferences, addressing algorithmic performance, and considering natural user interfaces in S-PSS. In conclusion, the study contributes to understanding adaptive user experiences, emphasizing key elements for future research and development.

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