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Artificial Intelligence Procurement Assistant: Enhancing Bid Evaluation

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Abstract. In modern business, maintaining competitiveness and efficiency necessitates the integration of state-of-the-art technology. This paper introduces the Artificial Intelligence Procurement Assistant (AIPA), an advanced system co-developed with Solita, a Finnish software company. AIPA leverages Large Language Models (LLMs) and sophisticated data analytics to enhance the assessment of procurement call bids and funding opportunities. The system incorporates LLM agents to enhance user interactions, from intelligent search execution to results evaluation. Rigorous usability testing and real-world evaluation, conducted in collaboration with our industry partner, validated AIPA's intuitive interface, personalized search functionalities, and effective results filtering. The platform significantly streamlines the identification of optimal calls by synergizing LLMs with resources from the European Commission TED and other portals. Feedback from the company guided essential refinements, particularly in the performance of ChatGPT agents for tasks like translation and keyword extraction. Further contributing to its scalability and adaptability, AIPA has been made open-source, inviting community contributions for its ongoing refinement and enhancement. Future developments will focus on extensive case studies, iterative improvements through user feedback, and expanding data sources to further elevate its utility in streamlining and optimizing procurement processes.

1 Introduction

Procurement bidding is a competitive process through which organizations seek to acquire goods, services, or projects from external suppliers or vendors [13]. This process involves inviting multiple suppliers to submit their proposals or bids for providing the required products or services [3]. The goal is to obtain the best value for the organization by allowing suppliers to compete based on factors such as cost, quality, delivery time, and other relevant criteria [10]. The

bidding process typically consists of the following steps: announcement or advertisement of the procurement opportunity, prequalification of potential suppliers, submission of bids, and the evaluation of bids [3].

Evaluating the bids in the bidding process needs reviewing the proposals to identify the supplier that aligns most closely with the organization's requirements [5]. This evaluation considers various elements, including, quoted price, the quality of goods or services, the supplier's prior history, their commitment, and other benefits they may offer. Evaluators depend on established benchmarks and rating mechanisms to fairly compare bids. The aim is to choose a proposal that not only fulfils the organizational needs but also provides the overall advantage and aligns with assessment standards [14].

The process of automated bidding evaluation leverages technology to enhance bid assessment within procurement procedures [7]. This technology-driven approach presents notable efficiency improvements, as automation significantly curtails the time and exertion required, thereby facilitating swift bid analysis [16]. Moreover, the automated systems introduce a crucial facet of uniformity in the application of evaluation criteria, effectively mitigating potential biases and errors that could arise [6]. This work stems from a research gap in the field – a need for streamlined, unbiased, and efficient bid assessment methods. In response to this research gap, we have developed and implemented the AIPA in collaboration with Solita Ltd[1]. The development of AIPA marks a substantial stride in meeting the requisites for effective and impartial bid assessment. This system integrates LLMs with data analysis techniques, automating and elevating the entire bid evaluation process.

In the procurement, conventional manual bid assessment procedures often grapple with inadequacies. It is within this context that AIPA emerged, aiming to transcend the limitations of the status quo. Making adept use of LLMs, with ChatGPT taking center stage, AIPA swiftly comprehends intricate bid documents, applies predefined evaluation criteria, and distills crucial information for expedited human decision-making-whether to accept or reject proposals. One of AIPA's distinctive strengths lies in its consistent application of evaluation criteria, eliminating subjective deviations. This stands in stark contrast to the inherent variability of manual evaluations, where individual interpretations can diverge significantly. Our industrial partners have expressed clear satisfaction with AIPA's performance and capabilities.

In this paper, we are discussing the background in Sect. 2, followed by the proposed system in Sect. 3. The evaluation of the system is being presented in Sect. 4, and finally, we are concluding the study and suggesting future research in Sect. 5.

2   Background and Motivation

In modern business practices, procurement plays a key role in ensuring the acquisition of goods and services necessary for organizational operations [15]. Central

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[1] https://www.solita.fi/.

to the procurement process is the critical task of bid evaluation, which involves assessing bids submitted by potential suppliers and selecting the most suitable ones based on a set of predetermined criteria [4]. However, traditional bid evaluation methods often face challenges related to subjectivity, manual effort, and potential bias, leading to inconsistencies and suboptimal decisions [11]. The use of Artificial Intelligence (AI) has brought about transformative changes in various industries, and procurement is no exception [9]. AI technologies have shown potential in automating and enhancing various aspects of the procurement process [8].

Machine learning enables software systems to learn from data patterns and make decisions based on specific requirements [2]. Models like GPT-3.5 and BERT have advanced the natural language processing, allowing machines to understand and create text that is similar to human [12]. These models have demonstrated their effectiveness in various tasks, including translating languages, generating text, answering questions, and analyzing sentiment [1].

Although AI in procurement is widely recognized, the area of bid assessment remains a critical area where AI based solutions could bring significant enhancements. Conventional bid evaluation methods often depend on manual analysis of bids, which can be time-consuming, labor-intensive, and subject to human biases [17]. Integrating LLMs into bid evaluation processes presents opportunities for organizations to enhance bid analysis, mitigate subjectivity, and improve the overall quality of decision-making.

Currently, bid evaluation methods are mostly characterized by manual efforts, extensive documentation, and the inherent risk of human-related errors. The need for more objective and efficient bid evaluation methods has become increasingly apparent, urging researchers and practitioners to explore novel avenues. In this context, our study aims to introduce an "Artificial Intelligence Procurement Assistant". This tool uses the capabilities of LLMs, turning bid evaluation into a more efficient, objective, and informed process.

3   Proposed and Implemented System

AIPA is a system that we propose and implemented to streamline and enhance the procurement process for businesses. Leveraging AI capabilities, we have implemented a user-friendly and efficient way for users to find and assess relevant procurement notices from the European Commission's TED portal. Our goal is to accelerate the procurement process by utilizing existing AI tools to assist businesses in making informed decisions about suitable procurement opportunities. Figure 1 present the key aspects of AIPA based on the high level system architecture diagram. Below, we provide a concise overview of AIPA's key features.

– **User Interface (UI)**: The AIPA UI serves as the primary point of interaction between users and the platform. Users, who are representatives of businesses, access the platform through this interface. We have implemented the UI to
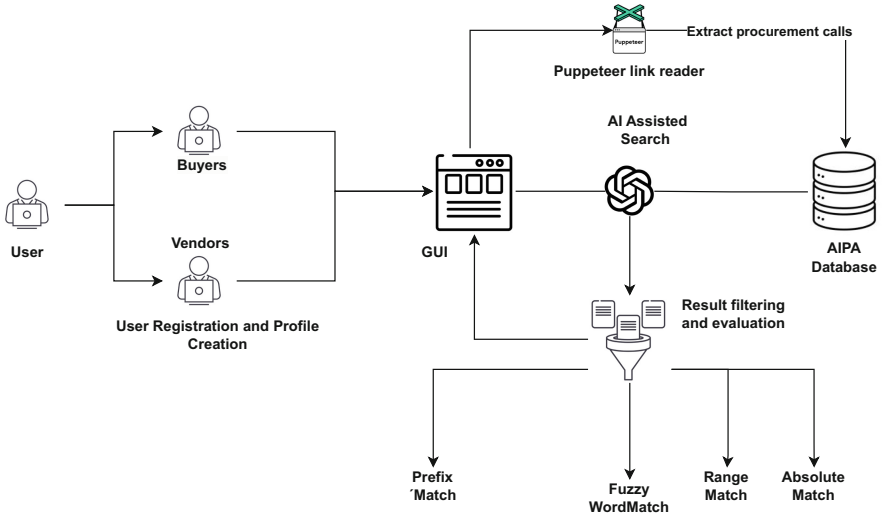
Fig. 1. High-Level System Architecture of AIPA

allow users to perform actions like registration, initiating searches, reviewing search results, and examining the generated list of procurement notices.

- **User Registration and Profile Creation**: A core functionality of AIPA is enabling users to register and create profiles. We have implemented an AI-assisted process to guide users in providing all the necessary parameters required for effective procurement notice searches. This AI-driven profile creation process enhances the relevance of search results and simplifies the registration process.

- **AI-Assisted Search**: AIPA utilizes ChatGPT to extract search parameters from user profiles. These parameters are then employed to conduct searches from AIPA database, which has been maintained to include procurement information from TED and other similar procurement websites. This is crucial for efficiently searching through large volumes of documents. Our implemented AI system, comprising multiple GPT agents with distinct roles and prompts to handles various tasks such as translation, keyword extraction, and generating similar words. These agents excel in distributed tasks rather than monolithic ones, contributing to improved results.

- **Results Filtering and Evaluation**: We have implemented a system that filters the search results obtained from the TED and other similar procurement websites and utilizes for evaluation. This process determines the relevance of these results to the user's profile. By doing so, we ensure that the presented procurement notices align with the user's business interests and preferences.

- **List Creation**: Based on the filtered and evaluated search results, our platform creates a list of the most suitable procurement notices. This list is presented to the user, providing a consolidated view of opportunities that match the user's requirements.

– **ChatGPT Agents**: As a core of AIPA, we have integrated several Chat-GPT agents for executing required tasks. These implemented agents assists in profile creation, parameter extraction, search execution, result evaluation, and justification generation. This component interacts with the TED portal to retrieve relevant procurement notices and performs AI-based analyses to enhance the overall quality of the procurement suggestions.

AIPA may acts as a valuable resource for businesses seeking efficient and effective ways to navigate the complexities of procurement processes. By integrating ChatGPT seamlessly, we assist users in finding procurement opportunities that align with their specific needs, thereby simplifying and expediting the procurement journey.

4   AIPA Evaluation

The development of the AIPA system involved a partnership with Solita Ltd., critical for its testing and refinement. Solita Ltd. acted as the main evaluator and user, providing regular feedback during the development of AIPA.

Our teams worked together through weekly meetings and discussions, focusing on tailoring AIPA to meet user needs effectively. These interactions ensured that each feature developed was in line with what users expected and needed, with Solita Ltd. providing timely and essential feedback on every step.

Solita Ltd. was also key in assessing the main functions of AIPA. They tested how easy and effective the system was to use, including how users registered and searched within it. For example, they looked at how well the AI helped users set up their profiles and if this made search results more relevant.

They also examined AIPA's search feature, especially its ability to understand search terms and find the most appropriate results. The company checked the filtering options and made sure that the final list of procurement notices was what users were looking for.

Furthermore, they evaluated the ChatGPT agents incorporated into AIPA, particularly their role in translating languages, picking out key terms, and assessing search outcomes. Their real-world testing was essential for us to improve the system further.

To encourage others to contribute to AIPA's improvement, we made it open source on GitHub[2]. This allows anyone interested to make changes and upgrades, helping AIPA to continue evolving and staying useful.

5   Conclusion

We have introduced the AIPA as an innovative solution aimed at streamlining and enhancing the procurement process for businesses in this paper. AIPA

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[2] https://github.com/koivupuu/AIPA.

uses the power of AI, particularly ChatGPT, to provide a user-friendly and efficient platform for users to identify and evaluate relevant procurement opportunities. Through the development and implementation of AIPA, we have effectively addressed critical challenges encountered by businesses during traditional manual bid assessment procedures. AIPA has the potential to become an invaluable tool for businesses navigating complex procurement processes. By integrating ChatGPT, it simplifies and expedites procurement, assisting users in making informed decisions and improving overall efficiency. As AI continues to advance, AIPA's potential for enhancement and growth presents exciting opportunities for future research and development in the field of procurement assistance.

Looking ahead to further enhance AIPA, **future efforts** will first prioritize the refinement of its AI capabilities, conducting comprehensive case studies to evaluate real-world impacts, gathering user feedback to facilitate iterative improvements, broadening data sources, and exploring customization options. These endeavors will ultimately elevate its utility in streamlining and optimizing procurement processes.

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