

SCOPE: A System for Customized and Optimized Project Enhancement for IT Project Management

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Received: 5 August 2025 | Revised: 31 August 2025, 11 September 2025, 15 September 2025, and 17 September 2025 | Accepted: 19 September 2025

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ABSTRACT

Project management in the development of Information Technology (IT) solutions faces significant challenges due to the diversity of methodologies available and the complexity of selecting the most appropriate approach for each context. Widely used tools such as Jira, Asana, Trello, Click Up, or Microsoft Project facilitate the planning and tracking of activities but do not offer personalized methodological recommendations. In the academic field, support models have been developed, such as the agile selection model based on decision trees and chatbots, or a conceptual methodology choice model, which provide structured rules and conceptual frameworks to guide the selection process. However, these models remain at the theoretical level and have not been validated in real-world environments. To address this issue, this study proposes SCOPE, a web-based system that uses Generative Artificial Intelligence (GAI) to recommend management methods tailored to the specific characteristics of each project. The solution comprises a conceptual model and technology architecture that integrates modules for authentication, task management, risk management, and intelligent assistance. Validation was performed using the Intra-class Correlation Coefficient (ICC), which yielded an average value of 0.812, indicating a level of concordance ranging from moderate to good with management experts. The System Usability Scale (SUS) also obtained an average score of 87.7. These results demonstrate that SCOPE is a practical and reliable tool to support methodological decision-making in IT projects, with potential applications in real organizational environments.

Keywords-IT project management; generative artificial intelligence; methodological selection; decision automation; structured prompts

I. INTRODUCTION

The management of development projects has evolved, characterized by changes in the methodologies employed. According to [1], before the rise of agile approaches, traditional methods, such as the waterfall model, were slow, inflexible, and costly, resulting in products that failed to meet customer satisfaction. In contrast, agile methods, according to [2], enable

adaptation to changing environments through iterative deliveries that enhance collaboration, communication, and product quality, thus increasing the likelihood of success. Although agile methods offer flexibility, they may encounter limitations, such as organizational resistance to change and difficulty in aligning with corporate culture [3]. In contrast, traditional approaches, while less adaptive, provide greater

control and predictability, which is beneficial in projects with stable requirements [4].

The management of IT-related projects presents increasing complexity due to the constant evolution of customer demands. The selection of the most appropriate management method is crucial for project success; however, this process is often cumbersome due to the variety of approaches available and the differing organizational strategies and policies [5]. In practice, project managers must make this choice manually, investing time in comparative analyses and relying on previous experience, without tools to facilitate a suitable recommendation [6]. Additionally, many current methodologies exhibit limitations when adapting to different contexts or project types, which reduces their effectiveness across varied scenarios. Consequently, the problem addressed by this study is the unsatisfactory performance in IT project management, arising from the absence of mechanisms that guide the selection and application of methods in a contextualized, dynamic, and effective manner throughout the project.

According to [7], only 39% of IT projects are completed on time by teams lacking agile maturity. Furthermore, adopting a poorly structured and agile approach to software management leads to cost overruns, delays, and low product quality. In [8], the need to facilitate the selection of appropriate approaches for leading specific projects in the fields of IT and IoT was analyzed, considering the lack of adequate tools. This study found that Scrum and SAFe are the most widely applied methods, and that large people-centered projects tend to adopt Scrum with 80% confidence. In the same vein, in [9], a model was designed based on a decision tree and a chatbot tool that considers attributes such as project size, roles and responsibilities, focus (processes or people), risk mitigation, and daily meetings.

In addition to accounting and decision-support tools, AI can drive the continuous improvement of cloud services. The framework in [10] leveraged AI techniques to optimize business intelligence in SaaS environments, applying Deming's Plan, Do, Check, and Act cycle by modeling data flows in Data Flow Diagrams (DFDs). These DFDs are used to identify performance bottlenecks, and then the process is iterated as a feedback loop to improve efficiency and refine decision-making. This approach underpins the design of SCOPE's Intelligent Assistance module with proven data-driven methods, demonstrating how the integration of AI can optimize actual services rather than purely theoretical concepts. Although studies such as [11] recognize that IT project management involves a high level of complexity and highlight its strategic role in achieving organizational objectives through the integration of agile methodologies, appropriate architecture, and multidisciplinary teams, most of these approaches are limited to general descriptions and do not include technological tools to address the identified challenges. These gaps represent an opportunity for SCOPE, which, in addition to analyzing the project, allows better monitoring and control.

To support this statement, a systematic bibliographic search was carried out in the Scopus and Web of Science databases, using strings such as "agile AND 'method selection' AND

'conceptual model' AND 'IT projects'". The analysis identified only two international models of methodological selection in IT projects, one developed in Denmark and another in Indonesia (see Table I), without finding evidence of similar proposals in the Peruvian context. Similarly, the review of the official Project Management Institute portal [12] did not report the existence of web systems oriented toward methodological selection in IT solutions projects.

The novelty of SCOPE lies in being the first web system designed and validated specifically for the Peruvian environment, offering a practical approach that integrates a literature review with technological implementation.

TABLE I. MODELS RELATED TO METHOD SELECTION

Feature	Agile selection model [9]	Conceptual method-choice model [5]	SCOPE (Proposed in this study)
Approach	A method-selection process based on structured rules and systematic decision-making.	Helps select management methods in the early stages of the project, considering contextual factors through a logical structure.	Web-based system integrating GAI to recommend management methods adapted to the specific characteristics of each project.
Use of Decision Tree	A decision tree is used to choose the appropriate agile method.	A decision-tree structure is employed, where branches represent successive choices based on project characteristics.	Does not rely on decision trees but uses structured prompts and GAI reasoning to analyze project data and issue recommendations in real time.
Methods applied	Scrum, XP, FDD, among others.	PMBOK, Scrum, XP, among others.	Traditional and agile methods, such as Cascada, PMBOK, Scrum, and Kanban.
Project context evaluation	Considers team size, product criticality, team experience, complexity, and organizational environment.	Considers innovation, uncertainty, complexity, time, budget, and team.	Considers multiple attributes of the project, including size, complexity, stakeholder roles, risk level, and tasks recorded on the platform.
Adaptability to different project types	Although it uses a flexible approach, recommendations are limited by the lack of data on certain methods.	Designed to adapt to both traditional and agile projects; however, it remains at a conceptual level and has not been validated in practice.	Validated in real environments with experts and users, demonstrating adaptability to projects of different sizes, complexity, and level of maturity.
Validation	Limited, based on conceptual evidence and illustrative examples.	Did not present practical validation but remained at a theoretical level.	Validation using two instruments: ICC and the SUS scale.

The purpose of this project was to design a web-based system called SCOPE, aimed at supporting the management of development projects in organizations within the technology sector. SCOPE incorporates GAI to automate the selection of IT project management methods, adapting to the size, complexity, stakeholder roles, and level of risk of each initiative. The system features modules for authentication,

project, task, and risk management, and employs a real-time database for all CRUD operations and information processing. The main contributions of this project include:

- A conceptual model based on GAI that enables the automated selection of methods in IT projects.
- A web-based system that implements the proposed model and facilitates the coordination, supervision, and control of initiatives within technology consultancy.
- A synthesis of existing systems and studies on methodological selection in IT projects, with an emphasis on the use of AI.

In summary, the problem addressed in this study is the unsatisfactory performance in IT project management due to the absence of mechanisms that guide the selection and methodological application in a contextualized, dynamic, and effective manner. Current tools are limited to planning and monitoring activities without providing tailored recommendations, while identified academic models remain at a theoretical level and lack practical validation, which is a clear research gap. Given this situation, the objective was to design and implement SCOPE, a web-based system based on GAI that allows to recommend methods adjusted to the specific characteristics of each project, through a conceptual model that formalizes the method selection process, the development of a web-based system to materialize this model, and the empirical validation of its effectiveness and usability with professionals in the sector.

II. METHOD

The method used to develop SCOPE followed three fundamental phases. In the first, a conceptual model of the system was designed and the system architecture was defined, after which the team developed each component and ensured its integration. Finally, in the third phase, the effectiveness of SCOPE in IT project management was validated.

A. SCOPE Model

SCOPE is a web-based system aimed at optimizing IT project management using GAI to recommend the most suitable methodology according to the project's specific characteristics. The process begins when the manager accesses the SCOPE web system from any device connected to the Internet. After registering or signing into their profile, users can create a new project or view the list of previously registered ones. To register a new project, users must complete a form detailing its main characteristics. Based on this information, the AI-driven system identifies potential risks, suggests relevant activities, and recommends the methodological approach that is best suited to the requirements. In addition, the system allows the manager to add other team members, facilitating collaboration and joint project tracking. Figure 1 graphically illustrates the interaction between the modules of the proposed SCOPE system.

In [13], an even more detailed framework is provided, which is essential for SCOPE. This study describes seven steps that turn message crafting into a quality-control cycle: first, defining the role the AI should assume, then supplying context,

stating the objective, setting parameters and constraints, precisely formulating the request specifying the output format, and finally reviewing the response to feed back into the process. This study also states that prompt engineering acts as a genuine "direction mechanism" that can be taught and refined, recommending its inclusion in professional training.

SCOPE faithfully reflects these steps: it identifies the agent as a project manager, immediately provides the case data, specifies the required response type, and subjects the result to internal validation before integrating it into the project.

The importance of refining instructions is underscored by the Garbage In, Garbage Out (GIGO) principle, which asserts that output quality depends directly on input quality. In [14], replacing generic messages with carefully formulated prompts increased the ICC for conceptual correctness from 0.08 to 0.75 (see Table II). This finding validates SCOPE's technical approach, where automated integration between the database and prompts maximizes the utility of GAI in project management.

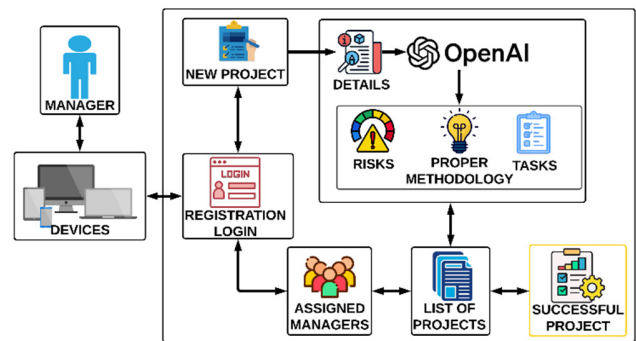


Fig. 1. Model of the SCOPE web system.

TABLE II. IMPROVEMENT WITH PROMPTS ACCORDING TO [14]

Evaluated criterion	ICC without prompt	ICC with prompt	Observed improvement
Conceptual correctness	0.08	0.75	Improvement in conceptual accuracy
Argument coherence	0.04	0.60	Improvement in reasoning
Inclusion of current evidence	0.04	0.62	Improvement in currency

The SCOPE prompt was defined—based on a review of the AI literature and the prompts' structure—as a set of formal guidelines that assign to the model the role of senior consultant in IT project management. It is executed during project creation and uses exclusively a JSON object with the user-provided project features, applying the GIGO principle to ensure input quality. The decision space is delimited by a closed list of methods chosen from the literature review, to avoid hybrid recommendations or uncontrolled variants. Its design is extensible, although at this stage it is limited to the methods identified in this review. It establishes precise rules that analyze only the JSON provided to select a single alternative without combining options and return only the exact name of the selected method without additional text, and in a format that

the system can automatically process. This design reduces illusions, improves the consistency of the results, and makes it easier to integrate into SCOPE.

```
const getProjectMethodologyAI = async (data) => {
  const prompt = `
  You are a senior IT project management consultant with over 15 years
  experience applying lifecycle methodologies and agile frameworks.
  STRICT INSTRUCTIONS
  1. Analyze only the information contained in the JSON object project.
  2. Choose exactly one of the following options: Waterfall, Iterative,
  3. Select the option that best matches the characteristics received.
  4. Do not combine options or invent new variants.
  5. Do not explain your choice or add extra text.
  6. Return only the exact name of the selected methodology or
  framework, without quotes.
  { "project": {
    "name": "${data.projectName || 'Not specified'}", "description": "${
    "size": "${data.size || 'Not specified'}", "complexity": "${data.co
    "clientParticipation": "${data.clientParticipation || 'Not specifie
    "iterative": "${data.iterative || 'Not specified'}", "projectType":`
```

Fig. 2. SCOPE methodology selection prompt.

B. Implementation of SCOPE

1) Architecture

SCOPE was implemented under a client-server-based architecture that separates the presentation layer from the system logic and caters to two types of users, project managers and stakeholders. The system is accessible from any device with an internet connection, which guarantees remote and secure interaction with all its functionalities. The logical architecture (see Figure 3) is organized into three main components. The web interface allows the user to register and manage projects, tasks, risks, and users. The server processes requests and runs AI analytics using the OpenAI API, while the cloud database is deployed with Firebase Firestore, which stores structured information and controls user access through Firebase Authentication.

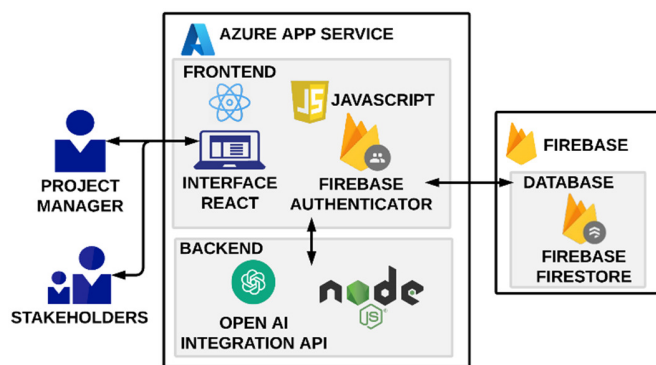


Fig. 3. Logical architecture of SCOPE.

2) Development

For the implementation of SCOPE, a front-end in React integrated with Firebase Authentication and Firestore was developed to manage and store data in real time. The backend was built in Node.js as a secure proxy for the OpenAI API, responsible for processing project information and returning

generated recommendations. Both components were hosted on Azure App Service, ensuring availability, performance, and scalability in production environments.

3) Modules

The Project Management Module enables managers to register new projects by specifying key attributes such as name, size, complexity, and client involvement, among others. Based on this information, a recommended method is assigned automatically (see Figure 4).

Fig. 4. Project creation.

The Task Management Module allows users to view, register, edit, and delete tasks associated with a project (see Figure 5). Each task may include description, status, assignees, dates, and dependency relationships with other tasks (predecessors and successors).

Fig. 5. Tasks associated with a project.

The Risk Management Module allows users to register risks associated with each project, detailing their nature, impact, and possible mitigation actions (see Figure 6). The AI model analyzes the registered tasks and chosen method to identify risks not previously considered and to propose appropriate management strategies.

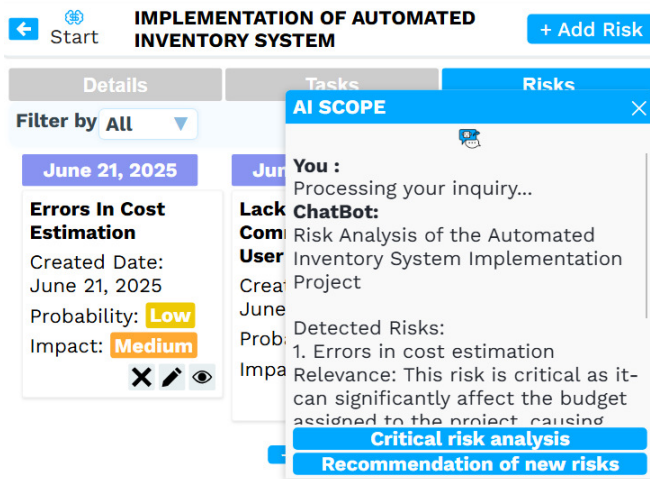


Fig. 6. Risks associated with a project.

The Intelligent Assistance (AI) Module is integrated into the project's detailed view, operating using OpenAI technology. Its primary function is to assist the user with comprehensive project analysis, including evaluation of the assigned method, validation of tasks, and identification of risks. This OpenAI technology verifies whether activities align with the recommended method and proposes justified improvements to optimize project management.

Finally, the User Profile Module allows users to edit their personal information and get their UID, a useful code for adding them to groups and projects.

C. Validation of SCOPE

To evaluate the effectiveness and usability of the SCOPE web system, two complementary methods were employed: the ICC and the SUS. The ICC quantified the level of agreement between the decisions generated by the system and those made by human specialists in IT projects, while the SUS measured users' perceived usability.

1) Population

The ICC validation of the SCOPE system involved nine professionals experienced in IT project management, certified in methodologies such as Agile, ITIL, and PRINCE2, who evaluated simulated cases as though they were real scenarios. Additionally, three independent judges anonymously assessed each case. These judges did not know whether the responses originated from a person or from the SCOPE system.

To complement the validation, a usability survey was administered to 30 professionals from an IT consulting company based in Lima, Peru. Of this group, 77% were men and 23% women, all with at least three years of professional experience in the field and performing roles related to

processes, infrastructure, services, and IT governance. The sample ranged from analysts to area heads, allowing for a broad and representative evaluation of the system from various functional perspectives.

2) Instrument

To validate the reliability of SCOPE, the ICC ($2, k$) was calculated, a two-way random-effects model with absolute agreement and an average of k raters, which estimates the proportion of variability attributable to true differences between cases versus that due to error or chance. The ICC yields a value between 0 (no agreement) and 1 (perfect agreement), with interpretation thresholds as follows: < 0.5 : poor; $0.5-0.75$: moderate; $0.75-0.9$: good; ≥ 0.9 : excellent [14]. The choice of the ICC is justified because it is a widely recognized standard for evaluating inter-evaluator reliability in studies with multiple judges, allowing for the estimation of both consistency and absolute concordance in decisions. Its application is particularly relevant in the validation of decision support systems, such as SCOPE, and has been proven to be effective in previous medical research [14]. The ICC facilitates checking whether the automated recommendations reach a level of agreement comparable to the criterion of human experts, providing objectivity and methodological soundness to the validation process.

3) Experiment

For the validation of the ICC, ten hypothetical scenarios of IT projects were designed, considering variables such as team size, customer involvement, deadlines, and documentation level. Case preparation was supported by evaluators, who brought their expertise to ensure that they were representative and based on real situations. This study sought to generate different contexts, from projects with high uncertainty to more structured ones, to rigorously evaluate the recommendations of both human experts and the SCOPE system.

Each scenario was included in an Excel file with one sheet per case, which contained four questions on methodology, rationale, tasks, and risks. Nine project management experts independently completed the templates, and a tenth was generated from SCOPE responses. The ten responses were then anonymized and redistributed in random order to three external judges who evaluated them without knowing their origin, thus reducing possible bias. The ratings assigned by the judges were recorded using Google Forms. Based on these scores, the ICC was applied to estimate the level of concordance between SCOPE and human expert responses. To calculate the ICC for each of the four variables evaluated, methodology, rationale, tasks, and risks, the collected data were exported and processed in Google Colab using Python. The whole process took place over three weeks in June 2025.

The SUS assessment was conducted through an experimental approach supported by a focus group using Google Meet to evaluate SCOPE's usability in a controlled environment. During the session, the full functionality and workflow of the application were demonstrated, its advantages highlighted, and the participants' questions were answered in real time. At the end of the presentation, the link to the deployed application was shared, allowing each participant to

test it with their assigned projects. Finally, users were asked to complete a usability survey, previously sent to their email addresses, to collect detailed impressions after interacting with the application.

III. RESULTS

A. Efficacy of SCOPE

The reliability of the recommendations generated by SCOPE was quantified using the ICC (2, k), applying a bidirectional model of random effects with absolute concordance. For the four attributes evaluated, ICC values ranged from 0.737 to 0.930, indicating a moderate to excellent overall agreement with the experts' decisions. The Justification reached an ICC of 0.930, the Tasks 0.837, the Risks 0.745, and the Methodology 0.737. The overall ICC average was 0.812, reflecting a good overall level of concordance between SCOPE and human assessment (see Figures 7 and 8).

Variable	ICC	Interpretation	Overall Average
0 Justification	0.930293	Excellent	2.40
1 Task	0.836858	Good	2.34
2 Risk	0.744802	Moderate	2.14
3 Methodology	0.737456	Moderate	2.11

Fig. 7. Results for ICC in SCOPE.

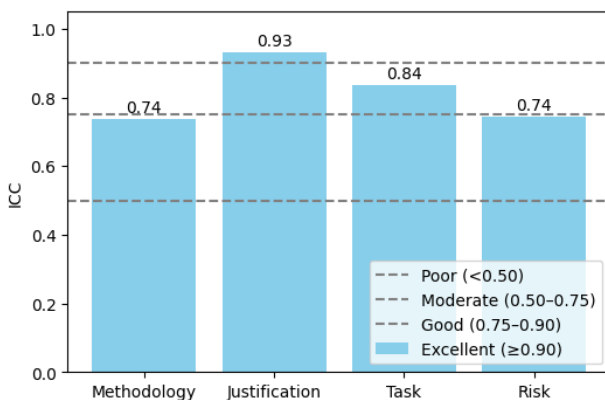


Fig. 8. ICC results in SCOPE by variable.

B. Usability of SCOPE

The usability of the SCOPE platform was assessed using the SUS, whose acceptance levels were interpreted according to the graphical model of [15]. This classification comprises three ranges: [0-50] is Unacceptable, associated with the adjectives Terrible and Deficient; [51-70] is Marginal, related to the label Regular; and [71-100] is Acceptable, corresponding to descriptors such as Good, Excellent, and Best Imaginable.

Overall, the results show that SCOPE achieved a moderate to excellent level of concordance with project management experts and obtained usability perceived as excellent by users. These findings suggest that the system not only reflects criteria consistent with those of specialized professionals but is also considered intuitive and reliable in its practical application.

These results allow us to interpret that SCOPE provides a balance between technical validity and acceptance of use, fundamental aspects for its implementation in real environments.

IV. DISCUSSION

The evaluation of agreement between the recommendations generated by SCOPE and the experts' decisions, measured using the ICC (2, k), revealed an overall moderate to good level of reliability, with ICC values ranging from 0.737 to 0.930 and a mean of 0.812. The Justification attribute achieved the highest degree of agreement (ICC = 0.930), which confirms that the Intelligent Attendance module solidly supports user suggestions and produces arguments consistent with the reasoning of experts. This superior performance is because the rationale provides explicit criteria and more context. By comparing the explanation of the SCOPE prompt with that of the specialist, the judges understand better the reasons for the choice, the ambiguity decreases, and the case-by-case comparison becomes clearer. The values for Task (ICC = 0.836) and Risks (ICC = 0.744) reflect moderate agreement, indicating variability in granularity and relevance of proposed activities and contingencies, possibly attributable to differences in each evaluator's expectations regarding the detail or context of each scenario.

In contrast to the above, the Methodology attribute presented the lowest correlation (ICC = 0.737), which shows discrepancies in the choice of approach. On several occasions, the experts did not limit themselves to recommending only one methodology per case and proposed alternatives or hybrid approaches, which increased dispersion and reduced concordance. In practice, project management tends to conclude with the adoption of a hybrid or adapted methodology, which is consistent with recent studies that point to the growing prevalence of combined approaches in IT environments [4].

In addition, previous studies have shown that AI can support the selection of agile methods [6] but lack empirical validation, whereas the results of this work show that SCOPE achieves a moderate to good level of agreement with experts (average ICC = 0.812). The relevance of using ICC as a reliability metric has also been confirmed in other domains, where ChatGPT and human specialists are evaluated [14], which reinforces the robustness of the approach adopted in this study. Finally, the usability score obtained (SUS = 87.7) aligns with the global trend toward intelligent decision support systems [10], positioning SCOPE as a practical and applicable contribution to IT project management. The SUS usability assessment gave an average score of 87.7, which puts it within the upper range of acceptability defined by [15]. This average reflects an excellent perceived user experience, which supports the system's suitability for deployment with end users.

V. CONCLUSIONS

The main novelty of this work is the proposal for SCOPE, a web-based system that combines a conceptual model with GAI to recommend management methodologies in IT projects, differentiating from previous models by integrating

authentication, task management, risk management, and intelligent assistance functions into a single platform. Its contributions include the design of a GAI-based conceptual model, the implementation of a functional web system that materializes this model, and the systematic review of existing systems, which identified gaps in methodological selection and highlighted the opportunity to incorporate AI into this process. As a second contribution, a web-based implementation of the proposed model was developed, providing comprehensive support for the coordination, supervision, and control of initiatives within a technology consulting firm. This tool not only operates the conceptual model but also serves as an interactive interface for end users, enhancing the project management experience through automated recommendations and clear project visualization, adapting to diverse organizational realities.

Based on the ICC validation findings, a measure of improvement is proposed to reinforce the design of the prompts used, promoting more precise and contextualized instructions that facilitate the generation of complete and coherent methodological descriptions. It is also recommended to consider upgrading the language model employed in the system to more advanced versions, such as GPT-4 or GPT-4o, which offer greater contextual understanding and specialized content generation. Implementing these actions would help increase the agreement among evaluators, strengthen the overall reliability of the SCOPE system, and better align the responses generated with the expectations of project-management experts.

The limitations of this study include several aspects. First, the geographical scope was limited to the Peruvian context, limiting the possibility of extrapolating the findings to other organizational and cultural environments. Second, the sample size was reduced, which affects the degree of generalization of the results. It was also decided to prioritize the development of the core system functionality and the integration of GAI through the OpenAI API with the GPT-3.5-turbo model, which creates a dependency on specific technology. This choice, along with the lack of implementation of advanced security mechanisms, is an aspect that should be strengthened in future iterations to increase the robustness, reliability, and security of the information handled by the platform.

As part of future work, it is proposed to enhance SCOPE's AI through predictive models capable of estimating the likelihood and impact of risks before they occur, optimization algorithms that prioritize and assign tasks considering critical dependencies, time, and resources, and the use of advanced language models trained with IT project data to generate more coherent, explainable, and adaptable methodological recommendations for changing scenarios.

ACKNOWLEDGMENT

The authors are grateful to the Dirección de Investigación de la Universidad Peruana de Ciencias Aplicadas (UPC) for the support provided for this study.

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