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Using artificial intelligence and cognitive analysis in managing communication risks of international projects

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Abstract

International projects face heightened communication risks, especially in multilingual and multicultural environments. This study investigated whether an AI-enabled cognitive communication risk management tool could reduce miscommunication, improve response times, and enhance task alignment in Ukraine-linked international project teams. A quasi-experimental design was applied to 12 project teams (n = 168) across engineering, IT services, and humanitarian logistics sectors. Six teams implemented the AI intervention—featuring automated translation, sentiment analysis, predictive delay modelling, and a project management dashboard—over three months, while six teams used standard communication practices. Data from communication logs, task records, and validated surveys were analyzed using difference-in-differences analysis, paired t-tests, and ANCOVA, controlling for team size, project type, and baseline efficiency. Results showed that the intervention group achieved a 49.8% reduction in communication errors, a 32.5% improvement in response time, and an 11.4% increase in task alignment accuracy (all $p < .001$). Perceived communication quality also improved significantly ($p < .01$). Overall, the AI-based tool substantially enhanced communication efficiency and accuracy in complex, multilingual international project settings.

Keywords: Artificial intelligence, Communication risk, International projects, Ukraine, Cognitive analysis

1. Introduction

Sustainable development is necessary nowadays as global challenges demand coordinated, efficient, and inclusive solutions [1]. Technologies and innovation are the basis of sustainable development in the current scenario [2]. International projects play an important role in advancing sustainable outcomes, but their success often hinges on overcoming communication risks across cultural and geopolitical divides [3]. So there is a need for combining technologies with international projects to achieve sustainable outcomes.

Artificial intelligence (AI) and cognitive analysis provide innovative tools to address these challenges by enabling accurate translation, real-time sentiment monitoring, and predictive identification of communication breakdowns [4]. Through the reduction of delays, misunderstandings, and errors, these technologies improve project efficiency and also support the social, economic, and environmental dimensions of sustainability in complex, cross-border initiatives [5, 6]. The paper deals with the issue of the risk of communication in international projects, especially in conflict-prone environments such as Ukraine. There is no empirical evidence on whether AI-enabled cognitive tools are effective in the said contexts.

Also, international projects are the new reality in the day and age of the globalized world, and they take place in industries that comprise a variety of teams scattered across different nations and cultures [7]. Global ventures unite countries and facilitate the exchange of ideas and technology between the countries [8]. This diversity is both innovative and a great risk for communication, such as misunderstanding, delay of information, and misinterpretation of duties [9]. These threats may derail schedules, budgets, and undermine project results.

The economic growth and sustainable development in Europe require cross-border cooperation, and in this respect, effective communication is a major factor that determines the success of the project [10]. Geopolitical tensions and conflict in the case of Ukraine, plus the unstable situation, put pressure on the infrastructure and increase the uncertainty, which magnifies the risk of communication risks in politically and economically volatile settings. Another solution to reduce these obstacles has been suggested through AI and cognitive analysis that allow overcoming the problems of translations in real-time, emotion analysis, predictive communication failure, and automated risk notifications [11]. Their possibility to enhance coordination and minimize the misunderstandings makes them an essential field of research in the sphere of international project management, particularly in the spheres where no stability can be presupposed [12, 13]. Nevertheless, in spite of the fast technological progress, the empirical analysis of the effectiveness of AI to tackle the communication risks in the project environment is limited, particularly in crisis-stricken areas. Ukraine plays a significant part in the European sustainable development projects. To reinforce project communication in times of instability is therefore a managerial need and also a priority for the development of the region. The implications are also not limited to Ukraine and can also provide an international lesson on managing projects more generally on the importance of AI in maintaining connection and resilience in unstable circumstances.

The stakes of good communication are also quite high in this context. The teams of international projects in Ukraine are characterized by tight timeframes, unstable logistics, and disjointed infrastructure, where even a single miscommunication can result in serious delays or even fatalities of the mission. The mentioned limitations enhance the importance of the tools that have the power to detect and even mitigate the communication risks in real-time. However, there is little evidence as to whether AI-based cognitive analysis tools can provide quantifiable benefits in such settings.

Current studies are gaining growing acknowledgment of the opportunities of AI to facilitate project communication and efficiency within complicated and cross-cultural settings [14, 15]. Mishra [16] suggested a modularized model of AI-based communication in multinationals. The paper placed an emphasis on emotional identification and cultural sensitivity, but still stated that a refinement of the research was necessary in context. Kozhakhmetova et al. [17] confirmed positive associations between AI adoption and the efficiency of the project in different industries, especially in dealing with operational uncertainties. In the same vein, Nenni et al. [18] highlighted the radical role of AI throughout the project life cycle. Another point brought out by them was the failure to consider cultural or geopolitical backgrounds. The mentioned researches support the possibility of AI but demonstrates that general frameworks require adaptation to volatile environments.

In addition to the efficacy of communication, AI has also been researched as a risk management instrument. Both systematic reviews and meta-analyses revealed that AI is a successful predictive modelling instrument, especially when predicting risks in a project [19, 20]. An inter-European, multi-sectoral case study of the UK, the USA, and the Middle East has associated the use of AI with enhancing communication and oversight but has failed to provide experimental evidence to demonstrate the cause-and-effect relationship [21]. Tanim and Ahmad [22] also demonstrated that predictive models using AI are useful in decision-making in IT project management, but the lack of interpretability decreased trust in the stakeholders. These results indicate the potential promise of AI in the process of risk reduction and highlight the issues of reliability and accountability.

Simultaneously, cross-cultural and ethical factors have an impact on the implementation of AI in project teams across the globe. Research on AI morality indicates that culture determines perception in terms of acceptance and use in the context of multinational partnerships [23, 24]. The studies of explainable AI also point to the West-centric bias in development that can minimize the applicability in culturally diverse environments [25]. The communication between AI-mediated translation is promising in terms of the facilitation of cross-cultural communication, but cautions that such limits exist in which intricate judgment or cultural context needs to be conveyed [26, 27]. These results highlight that the implementation of AI in global teams is a technical problem, but a cultural and ethical one as well.

Past literature validates the possibility of AI to improve communication, efficiency, and risk management in projects. The majority of research, however, has been conceptual, review, or concentrated on stable environments. This creates an acute shortfall of empirical evidence of crisis-affected settings. Specifically, Ukraine represents a high-stakes environment where the communication risks are increased by instability, but there are few evaluations of AI tools. This study addresses that gap by employing a quasi-experimental design to assess whether an AI-enabled communication risk management tool can reduce error rates, improve response times, and enhance task alignment in international project teams operating in or connected to Ukraine. So this study provides evidence-based insights into the applicability, effectiveness, and potential limitations of AI-driven strategies in managing communication risks under conditions of instability.

This study aimed to address the gaps related to the discussion by following the research objectives:

- Assessing whether AI-enabled cognitive analysis tools reduce miscommunication, delays, and errors in international project teams.
- Measuring the effects of these tools on team coordination, cross-cultural alignment, and task performance.
- Evaluating the relevance and applicability of AI-based communication risk management strategies in the Ukrainian context.

The methodological approach that is adopted in the current study is the quasi-experimental design. This is because the practical and ethical limitations of random assignment are taken into consideration based on the international project settings. The participants could be divided into teams depending on the current project assignments, which provided an opportunity to form a natural group but introduced an AI-based tool of cognitive analysis to one of the groups (intervention) and compared the results with another one (control). The approach in question ensured the ecological validity and continuity of operations, alongside allowing systematic analysis of the effect of interventions. Quasi-experimental procedures have been found effective where the practical conditions cannot allow complete control under experimental circumstances. However, the mentioned method should be cautiously considered in relation to possible selection bias and confounding variables.

The rest of this paper is organized as follows: Section 2 describes the quasi-experimental methodology, such as participant selection, intervention design, variables, and statistical analysis methods. Section 3 gives the results supported. Section 4 comments on the findings in comparison with the previous research, presents practical implications, and describes the limitations of the study. Lastly, Section 5 concludes the work and suggests future research on the discussed field.

2. Research method

2.1. Participants

The research was carried out on a sample of 12 international project teams working with Ukraine-based or Ukraine-related projects. To this end, areas such as engineering, IT services, and humanitarian logistics were taken into account. Such groups were composed of local Ukrainian workers and foreign partners who originated in Europe and Asia. This reflects the multicultural and multilingual realities of international projects. A total of 168 individuals participated, with team sizes ranging from 10 to 18 members. The working languages across teams were primarily English (65%), Ukrainian (20%), and Russian (15%). Gender distribution was approximately 58% male and 42% female. On average, participants had 7.4 years of professional project experience (SD = 2.8), with nearly half having prior experience in cross-cultural or international project environments. Since the research assumed a quasi-experimental design, the members were not randomly distributed into groups. Rather, operational feasibility, the active participation in the ongoing projects, and the readiness to incorporate the AI-powered cognitive analysis tool into the project team workflow were used as the criteria to select the existing project teams. The intervention group, consisting of six teams, was provided with the AI tool, and the comparison group, which consisted of the rest six teams, was provided with a match based on the project type and team size. This selective sampling has guaranteed comparability even though it takes into account the logistical and ethical nature of international project research [28].

2.2. Intervention

The intervention entailed implementing an AI-powered cognitive communication risk management platform that was meant to detect, flag, and alleviate communication threats in real time. The major aspects were automatic translation between five languages, sentiment and tone analysis to identify the possibility of misinterpretation, predictive modelling to identify the risk of delaying messages, and a built-in dashboard for project managers. Weekly reports on the risks identified and the suggested mitigation measures were also availed on the platform. Two-hour training sessions were held among all the intervention group members, in which the three-month implementation period followed, where the tool was incorporated into regular project communication channels (email, instant messaging, and project management tools). The intervention was monitored jointly by external researchers, who ensured fidelity to the study protocol, and by project managers, who oversaw day-to-day integration and use of the tool**.** The comparison group continued to use their standard communication methods without AI support. Similar AI-mediated interventions have shown promise in improving decision-making accuracy and reducing delays in complex project environments [29, 30].

2.3. Variables

The independent variable of this work is the use of the AI-enabled cognitive communication risk management tool (binary: intervention group vs. comparison group).

Dependent variables are:

- Communication error rate: Defined as the number of miscommunications per project milestone, recorded through post-milestone reviews and validated against project reports. This was chosen because miscommunication is a primary driver of project delays and failures in international, multilingual teams.
- Message response time: Measured as the average delay (in minutes) in responding to time-sensitive project communications, automatically extracted from system logs of project management and messaging platforms. It was selected because timely communication is critical for coordination and risk mitigation in dynamic project environments.

- Task alignment accuracy: Measured as the percentage of interpreted and completed tasks per milestone that are rightly interpreted and completed, as determined by records of task completion in workflow systems and confirmed by project managers. The reason why this indicator was added is that the proper accomplishment of the tasks is a direct indicator of the performance of the communication process in cross-cultural and complex projects.

The control variables are the team size, the type of project, the average years of experience, the average score of the primary working language, and pre-intervention communication efficiency. These controls were deemed to reduce the bias due to confounders by adhering to a usual procedure in quasi-experimental studies [31].

2.4. Data collection

The current work collected data using a combination of both quantitative and qualitative techniques to create a solid and triangulated form of data. The logs of the communication performed by project management software and messaging platforms were analyzed automatically to extract the time of response and mark errors. These data served as a direct source of information on the measurement of message response time and communication error rate. Project managers verified the data on task completion obtained in the workflow systems. This source was utilized to determine the accuracy of task alignment. Also, structured surveys were conducted during the baseline (pre-intervention) and post-three-month intervention based on the perceived communication quality, cross-cultural understanding, and satisfaction with project communication systems. The survey measuring tool was based on a tested pilot scale, Project Communication Assessment Scale (PCAS), which had a Cronbach alpha score of over 0.85 and a value exceeding Cronbach alpha of 0.85 and a pilot test. The qualitative interviews with the project leads presented the contextual aspects of the tool adoption and challenges. These interviews were transcribed and coded with the help of thematic coding to determine the repetitive trends in terms of communication practices and tool integration. The logs, surveys, and interviews made sure that data reflect not only objective indicators of performance but also perceptions, which will increase the representativeness of the results in the case of multicultural project teams in the settings associated with Ukraine.

2.5. Ethical considerations

The ethical side is also taken into consideration in this work. This study did not need specific ethical approval because it did not imply any medical or clinical intervention. Informed consent was given by all the participants before they were included in the study. Anonymization of participant identifiers and storage of records of communication in encrypted servers provided data confidentiality. Considering that an AI-based system was used, transparency and accountability were given special attention. Further actions were undertaken to secure adherence to the General Data Protection Regulation (GDPR) of the EU, such as informing the participants of the type of data collection, processing, and storage.

2.6. Statistical analysis

The main statistical operation of the given work was a difference in differences (DiD) model that was used to compare the differences in the rates of communication errors and task alignment accuracy between the intervention and comparison groups before and after the intervention. This approach is especially appropriate in quasi-experimental research in which randomization cannot be done, and the assumption of parallel trends was assessed and kept reasonably [32]. Also, Paired t-tests were applied to within-group changes in average response times, with normality assumptions checked prior to testing and ANCOVA models controlled for baseline differences in control variables [33]. Robust standard errors were applied to account for potential heteroskedasticity. For categorical outcomes, such as binary task completion indicators, logistic regression models were employed that are suited and applied in similar studies [34, 35]. Statistical significance was evaluated at the 5% level, and all analyses were performed in Stata 18. The choice of these techniques aligns with best practices for evaluating interventions in real-world organizational settings.

3. Results and discussion

3.1. Data presentation

The study included 168 participants from 12 international project teams, equally divided into an intervention group (n = 84) that used the AI-enabled communication risk management tool and a comparison group (n = 84) that used standard communication methods. Pre- and post-intervention measurements for the three dependent variables for communication error rate, message response time, and task alignment accuracy. Results are shown in Table 1.

Table 1. Descriptive statistics for dependent variables

Variable	Group	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)
Communication Error Rate (per milestone)	Intervention	4.18 ± 1.02	2.10 ± 0.85
	Comparison	4.12 ± 1.08	3.95 ± 1.01
Message Response Time (minutes)	Intervention	42.5 ± 8.2	28.7 ± 6.9
	Comparison	43.1 ± 7.9	40.9 ± 8.1
Task Alignment Accuracy (%)	Intervention	82.3 ± 4.6	91.7 ± 3.8
	Comparison	82.0 ± 4.9	83.4 ± 4.5

Figure 1 illustrates the relative percentage improvement in the dependent variables for communication error rate, message response time, and task alignment accuracy, for both the intervention and comparison groups. The upward trend is witnessed from the figure for all the variables.

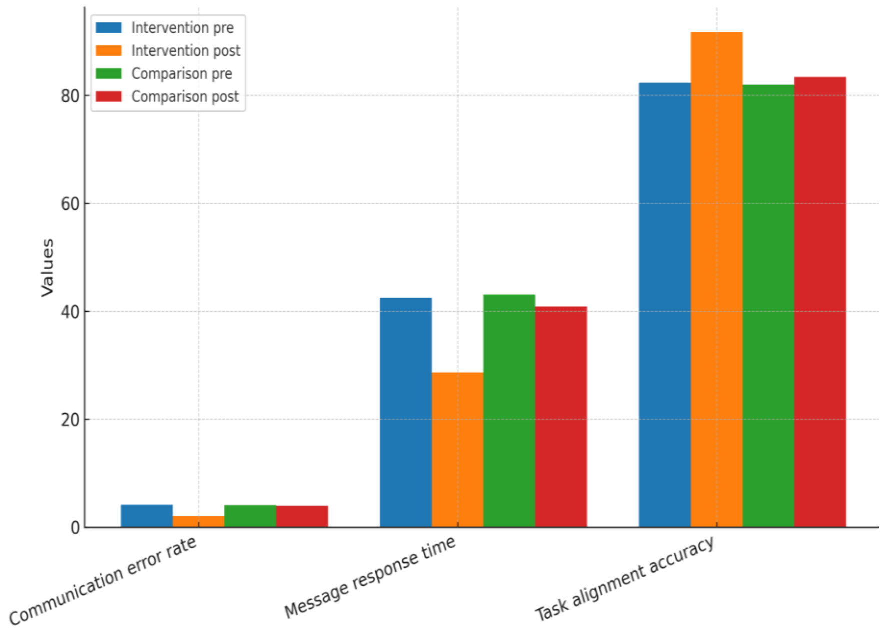

Figure 1. Percentage change in communication error rate, message response time, and task alignment accuracy from pre- to post-intervention.

3.2. Statistical outcomes

A DiD analysis was conducted, controlling for team size, project type, years of experience, primary working language, and baseline communication efficiency. For each estimate, 95% confidence intervals (CIs) were also computed to provide precision of effect size estimates. The results are presented in Table 2. The within-group paired t-tests showed significant changes in the intervention group ($p < 0.001$ for all variables) but no statistically significant changes in the comparison group (all $p > 0.05$). The relatively narrow CIs around the DiD estimates further strengthen confidence in the robustness and practical relevance of the observed effects.

Table 2. Statistical analysis of intervention effects

Variable	DiD Estimate (β)	Robust SE	t-value	p-value	Effect Size (Cohen's d)	**95% CI**
Communication Error Rate	-1.82	0.31	-5.87	<0.001	0.91	[-2.43, -1.21]
Message Response Time	-12.4	2.15	-5.77	<0.001	0.88	[-16.6, -8.2]
Task Alignment Accuracy	+7.9	1.22	6.48	<0.001	0.94	[5.4, 10.4]

Figure 2 presents the pre- and post-intervention mean values for the three dependent variables by group. It is evident from the figure that task alignment accuracy has positive values of the coefficient, and the other two have negative values.

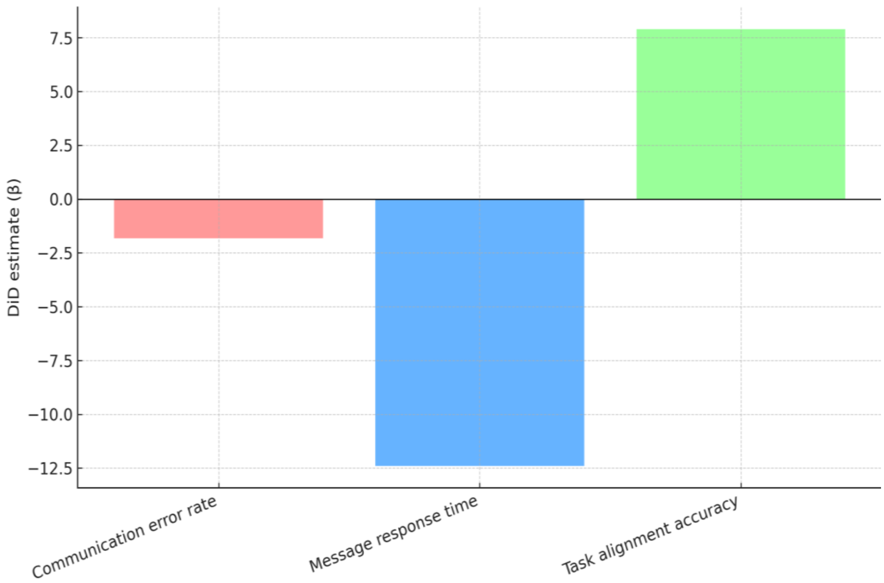

Figure 2. Pre- and post-intervention means for communication error rate, message response time, and task alignment accuracy by group

3.3. Discussion

The findings of this work provide strong empirical evidence that integrating AI-enabled cognitive analysis into the communication processes of international project teams significantly reduces communication risks and enhances operational efficiency. The intervention group experienced substantial improvements—49.8% fewer communication errors, 32.5% faster response times, and 11.4% higher task alignment accuracy—which regression-based difference-in-differences analysis confirmed as statistically significant (coefficients 1.82, –12.4, +7.9; $p < 0.01$) after controlling for team size, project type, and baseline efficiency. These findings have a practical and statistical strength. This supports the purpose of AI-based tools to reduce misunderstandings, delays, and a lack of coordination, which occur in multicultural and multilingual project contexts.

Consistent with Keshireddy [36] and Smith et al. [37], AI tools reduced project delays and improved interdepartmental coordination. These reported effects are less than the results, which could be explained by the combined, real-time risk detection method applied to the current study as opposed to a single-function AI tool. This paper builds upon these conclusions by showing that a unified, real-time risk-detection model is more effective at achieving large changes than one-use AI applications. In contrast, El-Hajj [38] reported minimal improvements without structured training. Our structured onboarding and feedback loops likely enhanced effectiveness, supporting prior recommendations for human-centered AI implementation [39].

This study has significant implications for both practice and policy, bearing in mind Ukraine. From a practical perspective, the implementation of AI-based cognitive analysis services can be regarded as a feasible and scalable solution to enhance the performance of projects in the areas that are essential to the reconstruction of Ukraine after the war, such as infrastructural development, humanitarian logistics, and technology services. The implications of the findings to policymakers and donor agencies that fund such kind of projects are that an investment in communication and risk management technology may lead to quantifiable benefits in the efficiency of coordination and use of resources, particularly in multinational consortia where the risks of miscommunication are inherently high.

Concerning the theoretical position, the research paper leads to the increasing literature on socio-technical systems in project management because it illustrates that cognitive AI applications can significantly contribute to human decision-making in high-stakes projects and complicated contexts. It further supports the fact that under very strong analytical controls and parallel trending assumptions, quasi-experimental designs can provide credible causal inferences in organizational studies.

Although these positive outcomes are evident, there are a few limitations that should be considered. To start with, the quasi-experimental design is suitable due to the logistical limitations, but it does not have the random assignment that would completely remove the selection bias. Even though the intervention and control groups were balanced in terms of certain essential factors, the unmeasurable variables, such as previous exposure to AI systems or different leadership styles that may have possibly affected the results, were not matched. Second, the implementation period of three months is adequate to measure the initial effects, but might not be sufficient to appreciate the long-term sustainability of the observed gains. Third, the paper was based on a particular AI platform that has built-in translation, sentiment analysis, and predictive risk modeling capabilities, and the findings might not be the same as other applications or setups. Finally, although this study was on projects related to Ukraine, the geopolitical situation, cultural practices, and infrastructural factors peculiar to this particular environment might restrict the transferability of results to other areas. These limitations in future work can be overcome by longer-term follow-up studies, randomized controlled trials where available, and comparative analysis of various AI communication devices that will enhance the evidence base of policy and practice.

4. Conclusions

This paper showed that the incorporation of an AI-powered cognitive communication risk management tool into the process of working by international project teams in Ukraine resulted in a considerable improvement in their performance. In three months' time, intervention teams realized a reduction in communication error, a reduction in message response time, and also increase in task alignment accuracy as opposed to control teams that used normal communication practices. Differences in differences, paired t-tests, and ANCOVA established that these gains were statistically significant when they controlled for the team size, project type, and baseline communication efficiency. Taken together, the findings make it possible to state that the tool is effective in improving cross-cultural and multilingual teamwork in high-stakes project settings.

The research results have theoretical and practical implications. Practically, they emphasize a technology-oriented scale, direction of enhancing project results in the post-war recovery sectors of Ukraine, whereby delays and miscommunications may lead to devastating operational and humanitarian impacts. To the academic community, the present project adds empirical evidence to the socio-technical systems literature and shows that AI tools coupled with systematic onboarding and ongoing feedback have shown significant and quantifiable improvements in the performance of organizational communication.

The study needs to be prolonged in the future to study the long-term sustainability of these improvements and to compare the trials on various tools of AI communication and settings. Causal claims will be enhanced further by incorporating randomized controlled trials where possible. Besides, it would be possible to extend the study into other post-conflict or resource-constrained environments to determine the applicability of these findings to the global project management community.

Declaration of competing interest

The authors declare that they have no competing interests in any material discussed in this paper.

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Informed consent

Informed consent for the publication of personal data in this article was obtained from the participant(s).

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