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AUTOMATING INSTITUTIONAL INTERNAL COMMUNICATION WITH A GENERATIVE ARTIFICIAL INTELLIGENCE AGENT AND SCHEDULED WORKFLOWS AT IFTO - ARAGUATINS CAMPUS

AUTOMAÇÃO DA COMUNICAÇÃO INTERNA INSTITUCIONAL COM AGENTE DE INTELIGÊNCIA ARTIFICIAL GENERATIVA E FLUXOS AGENDADOS NO IFTO - CAMPUS ARAGUATINS

AUTOMATIZACIÓN DE LA COMUNICACIÓN INTERNA INSTITUCIONAL CON UN AGENTE DE INTELIGENCIA ARTIFICIAL GENERATIVA Y FLUJOS PROGRAMADOS EN EL IFTO - CAMPUS ARAGUATINS

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Abstract

Internal communication in public educational institutions is often hindered by administrative overload, fragmented formal channels and slow information dissemination. This article describes the development, deployment and extension of an internal communication agent based on generative artificial intelligence at the Federal Institute of Tocantins (IFTO) - Araguatins Campus. The research, applied in nature and qualitative-descriptive in approach, followed an evolutionary prototyping cycle conducted at the Artificial Intelligence and Automation Research Laboratory (LEIAA). The solution, with a hybrid architecture (self-hosted Docker containers and cloud services), combines the n8n orchestration platform, the PostgreSQL database, the Evolution API messaging gateway and the GPT-4o-mini language model, integrated with Google Workspace services through the Model Context Protocol (MCP). The system operates in two modes: in the reactive mode, the language model interprets natural language requests and performs calendar, e-mail and spreadsheet actions; in the proactive mode, scheduled routines query institutional spreadsheets and send messages built from templates. Between May and June 2026, five proactive workflows (institutional events, undergraduate thesis defences, birthdays, academic calendar and scheduled messages) operated in three real WhatsApp groups of the campus, comprising staff, students and faculty. During this period, notices were sent daily according to the spreadsheet records, and the team observed no failures in the event and birthday dispatches. A comparison with systems described in the literature indicates that the solution combines actions executed by a language model, proactive messaging to groups and self-hosted orchestration; its effect on the communication team's routine, however, has not yet been measured.

Keywords: Generative artificial intelligence; institutional communication; workflow automation; Model Context Protocol; educational management.

Resumo

A comunicação interna em instituições públicas de ensino é frequentemente prejudicada pela sobrecarga das equipes administrativas, pela fragmentação dos canais formais e pela demora na difusão de informações. Este artigo descreve o desenvolvimento, a implantação e a ampliação de um agente de comunicação interna baseado em inteligência artificial generativa no Instituto Federal do Tocantins (IFTO) - Campus Araguatins. A pesquisa, de natureza aplicada e abordagem qualitativo-descritiva, seguiu um ciclo de prototipagem evolutiva conduzido no Laboratório de Pesquisa em Inteligência Artificial e Automação (LEIAA). A solução, de arquitetura híbrida (contêineres Docker self-hosted e serviços em nuvem), combina a plataforma de orquestração n8n, o banco de dados PostgreSQL, o gateway de mensagens Evolution API e o modelo de linguagem GPT-4o-mini, integrado a serviços do Google Workspace por meio do Model Context Protocol (MCP). O sistema opera em dois modos: no reativo, o modelo de linguagem interpreta solicitações em linguagem natural e executa ações de agenda, e-mail e planilha; no proativo, rotinas agendadas consultam planilhas institucionais e enviam mensagens montadas a partir de templates. Entre maio e junho de 2026, cinco fluxos proativos (eventos institucionais, defesas de Trabalhos de Conclusão de Curso, aniversariantes, calendário acadêmico e disparos agendados) operaram em três grupos reais de WhatsApp do campus, que reúnem servidores, estudantes e docentes. No período, os avisos foram enviados diariamente conforme os registros das planilhas, e a equipe não observou falhas nos disparos de eventos e de aniversários. A comparação com sistemas descritos na literatura indica que a solução reúne execução de ações por modelo de linguagem, envio proativo em grupos de mensageria e orquestração auto-hospedada; seu efeito sobre a rotina do setor, porém, ainda não foi medido.

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Palavras-chave: Inteligência artificial generativa; comunicação institucional; automação de fluxos; Model Context Protocol; gestão educacional.

Resumen

La comunicación interna en las instituciones públicas de enseñanza se ve frecuentemente perjudicada por la sobrecarga de los equipos administrativos, la fragmentación de los canales formales y la demora en la difusión de información. Este artículo describe el desarrollo, la implantación y la ampliación de un agente de comunicación interna basado en inteligencia artificial generativa en el Instituto Federal de Tocantins (IFTO) - Campus Araguatins. La investigación, de naturaleza aplicada y enfoque cualitativo-descriptivo, siguió un ciclo de prototipado evolutivo conducido en el Laboratorio de Investigación en Inteligencia Artificial y Automatización (LEIAA). La solución, con arquitectura híbrida (contenedores Docker self-hosted y servicios en la nube), combina la plataforma de orquestación n8n, la base de datos PostgreSQL, la pasarela de mensajería Evolution API y el modelo de lenguaje GPT-4o-mini, integrado a servicios de Google Workspace mediante el Model Context Protocol (MCP). El sistema opera en dos modos: en el reactivo, el modelo de lenguaje interpreta solicitudes en lenguaje natural y ejecuta acciones de agenda, correo electrónico y hoja de cálculo; en el proactivo, rutinas programadas consultan hojas de cálculo institucionales y envían mensajes construidos a partir de plantillas. Entre mayo y junio de 2026, cinco flujos proactivos (eventos institucionales, defensas de Trabajos de Fin de Curso, cumpleaños, calendario académico y envíos programados) funcionaron en tres grupos reales de WhatsApp del campus, con servidores, estudiantes y docentes. En el período, los avisos se enviaron diariamente según los registros de las hojas de cálculo, y el equipo no observó fallos en los envíos de eventos y de cumpleaños. La comparación con sistemas descritos en la literatura indica que la solución reúne la ejecución de acciones por un modelo de lenguaje, el envío proactivo a grupos de mensajería y la orquestación autoalojada, aunque su efecto sobre la rutina del sector aún no se ha medido.

Palabras clave: Inteligencia artificial generativa; comunicación institucional; automatización de flujos; Model Context Protocol; gestión educativa.

1. Introduction

Institutional communication is a condition for the proper functioning of educational institutions. In these settings, internal communication must be accurate, timely and able to reach different audiences. At the Federal Institute of Tocantins (IFTO) - Araguatins Campus, the overload of administrative teams, the fragmentation of information and the low adherence to formal channels compromise the agility of internal processes and the engagement of the academic community.

The problem becomes concrete in the routine of the office responsible for disseminating information. The team is small, accumulates duties and relies on limited technological infrastructure; it is responsible for writing, formatting, replicating and repeating notices across different channels and groups of recipients. Meeting notices, thesis committee calls and academic calendar deadlines depend on manual, repetitive work. Under these conditions, information tends to circulate

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late, and informal channels come to fill the gaps left by the official ones.

Generative artificial intelligence (AI) offers new possibilities for automating routine tasks. Korzynski et al. (2023) point out that generative AI systems can automate repetitive administrative tasks, such as scheduling appointments, generating documents and keeping records. In higher education, recent studies examine the use of generative chatbots by students and teachers (Kayalı et al., 2023; Ilieva et al., 2023). Less frequent, however, are reports of applications in which a language model operates integrated with several institutional tools at the same time, such as calendar, e-mail, spreadsheets and messaging, and in which the institution takes the initiative of sending information to its audience.

The following research question is therefore defined: how can delays in internal communication be reduced and the dissemination of academic and administrative information be automated in a public educational institution with a small team, limited infrastructure and high demand for information?

The general objective of this work was to develop, deploy and qualitatively evaluate an internal communication agent based on generative AI at IFTO - Araguatins Campus. The specific objectives were: (i) to integrate Google Calendar, Gmail, Google Sheets and WhatsApp through the n8n automation platform and the Model Context Protocol (MCP); (ii) to enable the interpretation of natural language requests and the execution of scheduling and messaging actions; (iii) to extend the solution with automated workflows that send notices without a prior request; and (iv) to compare the solution with institutional communication systems described in the literature.

The study describes the architecture, the deployed workflows and the evidence of use of a communication agent in a public educational institution, and positions it in relation to similar systems. The article is organised in five sections: after this introduction, the literature review presents the foundations and related work; the methodology describes the architecture, the validation procedures, the processing of personal data and the security model; the results and discussion section presents the deployed workflows, the evidence of operation and the comparison with other systems; and the conclusion returns to the research

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question.

2. Literature Review

2.1 Generative artificial intelligence in management and education

Korzynski et al. (2023) discuss generative AI as a new context for management theories, based on an analysis of ChatGPT. Among the applications the authors point out is the automation of repetitive tasks, such as scheduling appointments, generating work documents and keeping records, as well as time management and sending reminders of important tasks. In educational institutions, dissemination routines have similar characteristics: they are frequent and follow predictable patterns.

In the educational field, studies focus on the interaction of students with conversational assistants. Kayalı et al. (2023) investigated, with mixed methods, the experience of 84 university students with ChatGPT-supported online learning applications; participants considered the information sufficient and topic-oriented, and the authors warned of incorrect or misleading answers and of the need for further research on the safe use of the tool. Ilieva et al. (2023) compared characteristics of generative chatbots applied to higher education and proposed a framework for their use in blended learning. Mendoza et al. (2022) presented a model for developing chatbots that support teaching and learning, with a multiplatform implementation and user evaluation.

In these works, the system answers questions asked by the user. In institutional communication, some messages must be sent before anyone asks, such as the notice of an approaching deadline. The present work addresses this second situation and also keeps the ability to answer questions.

2.2 Model Context Protocol and tool integration

For a language model to perform actions in other systems, it must be connected to external tools. Hou et al. (2026) describe the Model Context Protocol (MCP) as a protocol that standardises this connection, with bidirectional communication and dynamic tool discovery, and contrast it with integrations in

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which the developer must manually define the interfaces of each service. According to the authors, the protocol separates the implementation of tools from their use by the model, which favours the formation of an interoperable ecosystem. The same study organises the security threats associated with MCP into a taxonomy of attack scenarios, a relevant aspect when the protocol is used with institutional data.

2.3 Self-hosted infrastructure and compact models

The adoption of this architecture in public institutions faces two practical constraints: control over data and operating cost. Regarding the first, Pawar et al. (2025) report the deployment of n8n in a Docker container, in a self-hosted configuration, to automate software development and operations routines, and point to greater control over the execution environment and gains in speed and reliability in task execution. This is a technical report published in a rapid-review journal, and its results should be read with this caveat. Control over where data is processed is relevant for Brazilian public institutions, which handle personal data under the Brazilian General Data Protection Law (Lei Geral de Proteção de Dados Pessoais, LGPD).

Regarding cost, Rodriguez et al. (2026) compared document classification performed by language models with that performed by human coders, in the context of urban systems management. With text segmentation (chunking), the models evaluated, including GPT-4o-mini, showed significant agreement with the human raters. The study does not compare compact models with larger ones; for this work, what matters is that GPT-4o-mini, the model used here, is among the models with this result. Based on these two works, this study adopted a self-hosted orchestration platform and a compact model accessed through an API.

2.4 Automated institutional communication systems

Rodrigues et al. (2025) developed Sabiá, a generative AI chatbot aimed at the everyday academic questions of students at the Federal University of Technology - Paraná (UTFPR), Dois Vizinhos Campus. The web application, built with Streamlit, uses retrieval-augmented generation (RAG), with the LangChain library and the ChromaDB vector database, over institutional regulations in PDF,

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such as those on didactic-pedagogical organisation, undergraduate thesis, internship and complementary activities. The language models are accessed through the OpenRouter platform, the same one used in this work, and GPT-4o-mini is among the models tested. The answers were compared with a list of frequently asked questions built from real questions about internships, using textual similarity metrics and a language model acting as evaluator (LLM-as-a-Judge); Phi 4, Gemini 2.0 Flash and Gemma 3n showed the most consistent results in quality and response time. Tests with students and faculty were indicated by the authors as future work.

Fernandes and Silveira (2024) developed, at the Federal Institute of Ceará (IFCE), Tianguá Campus, a chatbot to answer questions about the student assistance policy. The solution uses Dialogflow, based on intent recognition, on Telegram, and the Make automation platform, connected to WhatsApp through the Z-API service. The chatbot answers students' questions and was evaluated with the System Usability Scale (SUS) with 12 participants, scoring 88.75.

The two works make it possible to position the solution described in this article. The first uses generative AI, with access to the models through the same provider adopted in this work, to answer academic questions; the second is a case from the federal network of vocational education that uses WhatsApp and a workflow automation tool. The comparison between them and the developed system is presented in section 4.3.

3. Methodology

3.1 Research characterisation

The investigation is characterised as an applied study with a qualitative-descriptive approach, aimed at real institutional communication problems. The research was conducted at IFTO - Araguatins Campus, under the technical supervision of the Artificial Intelligence and Automation Research Laboratory (LEIAA). The method was based on the evolutionary prototyping cycle, in which the software architecture was iteratively refined to combine service orchestration with generative AI models. The process comprised two stages: (i) construction and

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functional validation of the AI agent in a controlled environment; and (ii) an adjustment stage, between May and June 2026, in which new workflows were deployed based on suggestions recorded while monitoring the use of the system by the campus Communication Office.

3.2 Infrastructure and provisioning

The infrastructure adopted a hybrid architecture, combining self-hosted components with external cloud services. The orchestration, memory and messaging gateway components were hosted by the team on a local server of IFTO, so that workflow orchestration would not depend on external SaaS platforms; the language model, accessed through the OpenRouter platform, the Google Workspace services (Calendar, Gmail and Sheets) and the WhatsApp infrastructure, operated by Meta, remained external. Provisioning used Docker containers, orchestrated with Docker Compose, which made it possible to isolate processes and manage hardware resources. The environment was built around three main services: the n8n workflow orchestrator, on port 5678, which acts as the integration hub; the PostgreSQL relational database, on port 5432, used as the AI agent's long-term memory, storing conversation vectors and transaction logs; and the Evolution API messaging gateway, on port 8080, which handles programmatic communication with WhatsApp. The Evolution API connects to WhatsApp through the Baileys library, which implements the WhatsApp Web protocol: the number used by the system is linked as a companion device, as in WhatsApp Web, and the official WhatsApp Business Platform (Cloud API) offered by Meta was not used. Version 3.6 of the Evolution API was used. The choice of a locally hosted n8n took into account the report by Pawar et al. (2025) on control over the execution environment.

The operational logic was designed to deal with the fragmentation typical of instant messaging conversations. A fourth service, the Redis in-memory database, was used as a message buffer: the input workflow captures messages sent in quick succession, stores them temporarily and groups them into a single context block before submitting them to the language model. JavaScript code execution nodes (Code Nodes) perform deterministic data handling, such as formatting dates in the

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Brazilian standard (DD/MM/YYYY) and calculating deadlines.

3.3 Interoperability layer: Model Context Protocol

The integration between the language model and the Google Workspace tools was structured according to the Model Context Protocol. MCP clients were configured for each service, exposing tools to the model: the Google Calendar MCP, with the CreateEvent, UpdateEvent and DeleteEvent tools, for calendar management; the Gmail MCP, with SEND_EMAIL and REPLY_EMAIL, for sending and replying to messages; and the Google Sheets MCP, with the Get Rows and Append Row read and write tools, for querying and updating the administrative data sources. This layer corresponds to the separation between the implementation and the use of tools described by Hou et al. (2026). The MCP servers were implemented in n8n itself: MCP Server Trigger nodes expose native n8n nodes for Google Calendar, Gmail and Google Sheets as tools, and the AI agent accesses them through MCP Client Tool nodes. No third-party MCP server was used; the tools exposed to the model are the n8n nodes configured by the team. The Google services are accessed with OAuth credentials of an institutional IFTO account, and access to these credentials in n8n is restricted to the members of the laboratory. The credentials were granted full access to the services of the account, such as Gmail, Google Drive, Google Meet, Google Sheets and Google Calendar, beyond what the tools exposed to the model require.

3.4 Cognitive core and prompt engineering

The cognitive core used the openai/gpt-4o-mini model, accessed through the OpenRouter API. The choice took into account the operating cost and the result of Rodriguez et al. (2026), who recorded significant agreement between this model and human raters in a text classification task. The model acts only in the reactive mode: it interprets incoming messages, decides which tools to call and writes the answers. To align the AI agent with institutional rules, prompt engineering was applied in the System Message node, with guidelines in three groups: persona and role, defining the role of IFTO's internal communication agent; tool restrictions, which limit answers to the available tools (Gmail, Calendar and Sheets) and prevent

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use for non-work matters; and response protocols, with mandatory identification at the start of interactions and standardised formatting.

3.5 Time-based automation layer

The proactive workflows are started by scheduling trigger nodes (Schedule Triggers, based on CRON expressions), executed every day at times defined for each workflow. Each execution queries the corresponding spreadsheet in Google Sheets, and JavaScript code nodes compare the current date with the recorded dates, select the records that meet the workflow's sending rule, such as the lead time before a deadline or the date scheduled by the team, and fill in a message template with the fields of each record, such as title, date, time, place, link and name. The resulting message is sent through the Evolution API to the defined groups or contacts and, in the case of birthdays, also by institutional e-mail. These workflows do not use the language model: the content of the messages is determined by the template and by the recorded data.

Figure 1 presents the resulting architecture. The two modes share the same n8n instance, the Google Sheets data sources and the Evolution API gateway, but follow different processing paths: the reactive one goes through the AI agent and the MCP clients; the proactive one, through scripts and templates. The proactive workflows were added with new triggers, scripts and templates, without changing the AI agent. In this article, the expression “internal communication agent” refers to the system as a whole, which brings together the two modes, and “AI agent” refers only to the component based on the language model.

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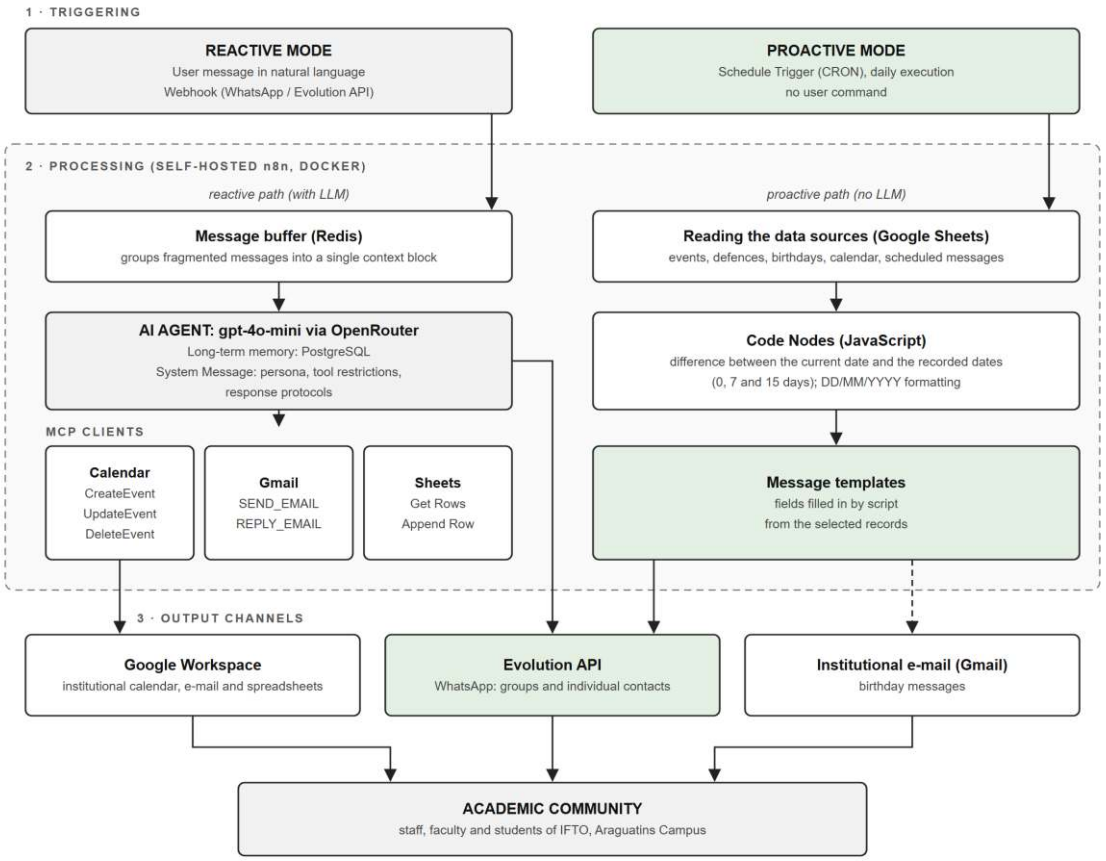
Figure 1 - Architecture of the internal communication agent: triggering modes, processing and output channels



Source: Prepared by the authors (2026).

Figure 1 is organised in three layers, read from top to bottom. In the triggering layer, the reactive mode is started by a user message received through a webhook, and the proactive mode by the CRON triggers, with no user command. In the processing layer, the reactive path, on the left, goes through the message buffer in Redis, the AI agent, which uses PostgreSQL as memory and follows the System Message guidelines, and the MCP clients; the proactive path, on the right, reads the spreadsheets in Google Sheets, calculates in the Code Nodes the difference between the current date and the recorded dates and fills in the message templates. In the output layer, the two paths converge on the Evolution API, which delivers both the AI agent's answers and the proactive workflow notices on WhatsApp. The reactive path also acts on the Google Workspace calendar, e-mail and spreadsheets through the MCP clients, and the proactive path uses institutional e-

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mail only for birthday messages, indicated by the dashed arrow.

3.6 Validation procedures

The validation cycle used black-box functional testing on two fronts. In the reactive validation, users sent natural language requests for meeting scheduling and queries; an interaction was considered successful when the AI agent correctly extracted date, time and title and performed the corresponding action in Google Calendar. In the proactive validation, it was checked whether the workflows queried the recorded data sources, processed the dates by script and sent the notifications through the Evolution API without human intervention, with the expected recipient, date and content.

In the adjustment stage, between May and June 2026, the workflows began to operate in three real communication environments of the campus, all of them WhatsApp groups: the official staff group of IFTO - Araguatins Campus, with 123 members; the group of students of the Licentiate Degree in Computing, with 174 members; and the group of teachers of the course board, with 20 members. Evidence was collected by direct observation of the messages sent in these groups and recorded in screenshots; the team also monitored the occurrence of sending failures. The evidence is restricted to the outputs of the system: the date, content and recipient group of the messages sent.

3.7 Ethical aspects

The workflows were deployed as an administrative activity of the campus Communication Office, authorised by the campus management, to automate notices that the office already sent manually. Members of the three groups were informed about the automated sending. The decision to report this experience in a scientific article was taken after the operating period, from July 2026 onwards, and the study was therefore not submitted to a Research Ethics Committee. Reactions, replies or other behaviour of group members are not used as evidence in this article, and the screenshots were cropped to show only the messages sent by the system.

In the figures of this article, names of people, group member lists and meeting links were hidden by the authors. In the birthday workflow, staff data come

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from the list that the human resources office sends monthly to the campus Communication Office, which already announced birthdays before the automation; the workflow automated this routine with the same data source, without specifically consulting staff about the automated sending. These measures relate to the principles of the LGPD, but do not constitute a complete compliance assessment; the personal data processing chain and its open points are described in section 3.8.

3.8 Personal data processing

Table 1 describes the personal data processed by the system, with their origin, purpose, the systems and providers involved, retention and the occurrence of international transfer. The data sources of the proactive workflows are provided by the IFTO management itself, and IFTO acts as the controller of the processing.

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Table 1 - Personal data processed by the system

Data and purpose	Origin	Systems and providers	Retention	International transfer
Staff name, date of birth, telephone and institutional e-mail, for birthday messages	Monthly list from the human resources office, provided by the IFTO management	Google Sheets and Gmail (Google); n8n and Evolution API on the local server; WhatsApp	No deletion period defined	Possible, depending on the location of Google's data centres
Names of students, thesis titles, event and calendar data and meeting links, for notices of events, defences and deadlines	Spreadsheets provided by the IFTO management	Google Sheets (Google); n8n and Evolution API on the local server; WhatsApp	No deletion period defined	Possible, depending on the location of Google's data centres
Telephone number and text of the messages sent to the reactive mode, for interpreting requests and executing actions	Authorised users (list of numbers)	Redis (temporary buffer) and PostgreSQL (memory) on the local server; OpenRouter and the model provider	PostgreSQL: full history, with no deletion period; OpenRouter and model provider: default policies	Yes: OpenRouter and model provider (United States)
Calendar events and e-mails created or answered by the AI agent, for scheduling and correspondence	Requests of authorised users	Google Calendar and Gmail (Google), institutional account	Policy of the institutional account	Possible, depending on the location of Google's data centres

Source: Prepared by the authors (2026).

The IFTO data protection officer was consulted about the deployment. The legal basis of each processing operation was not formally documented. For public entities, article 23 of the LGPD provides for processing aimed at carrying out the legal competences or attributions of the public service, and its applicability to these routines has to be assessed by the institution. Sending messages to OpenRouter and to the model provider constitutes an international transfer, governed by article 33 of the LGPD and by Resolution CD/ANPD No. 19/2024, which require one of the

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mechanisms provided for in the regulation, such as standard contractual clauses. OpenRouter acts only as a gateway between the workflows and the model; its privacy options were kept in their default configuration, and no data processing agreement was signed beyond the standard terms of use. These points are treated as limitations in section 4.5.

3.9 Security model

The proactive workflows do not receive input from users: they read the spreadsheets and fill in templates, without the language model. The exposure related to the language model is therefore concentrated in the reactive mode, which receives free text and can call tools that write to the calendar, send e-mails and alter spreadsheets.

Three controls were applied to this mode. Authentication is based on a list of authorised telephone numbers: the nodes of the input workflow check the sender's number, and messages from numbers not on the list are ignored and do not reach the AI agent; the System Message repeats this restriction. The System Message also instructs the AI agent to ask the user for confirmation before calling DeleteEvent; no confirmation is requested before sending or replying to e-mails (SEND_EMAIL and REPLY_EMAIL). The tools exposed to the model are limited to the n8n nodes configured by the team, and access to the Google services uses the credential of an institutional account. The restrictions written in the System Message (section 3.4) guide the behaviour of the model, but they depend on the model following the instructions and do not constitute an authorisation mechanism.

Hou et al. (2026) describe, among the security threats of the MCP ecosystem, tool poisoning, in which malicious instructions are inserted in tool descriptions; indirect prompt injection, in which instructions embedded in external content processed by the model alter its behaviour; credential theft; and unauthorised access. As mitigations, the authors list the principle of least privilege, mandatory authentication, human confirmation of sensitive actions, isolation of components and audit logs. In this deployment, the use of MCP servers implemented in the team's own n8n instance removes third-party tool descriptions

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as a source of tool poisoning. The risk of indirect prompt injection remains: the content of spreadsheet rows and of e-mails handled by the tools enters the context of the model and could carry instructions. The OAuth credentials stored in n8n give access to the institutional account, and their protection depends on the security of the local server. Since these credentials have full access, the configuration does not follow the principle of least privilege: a compromise of the n8n instance would expose all the services of the account, including those not used by the tools. The n8n execution history and the conversation history in PostgreSQL allow actions to be reconstructed, but no audit procedure was defined, and no prompt injection tests were carried out.

4. Results and Discussion

4.1 Operation in a real environment

During the evaluated period, the system was used by the Communication Office of IFTO - Araguatins Campus to disseminate announcements, academic and administrative events and institutional notifications. The daily checking routine generally produced at least one notice per day, varying according to the events recorded in the spreadsheets. The team observed no failures in sending the messages for recorded events and birthdays. This record is qualitative: the total number of dispatches and the delivery rate were not extracted from the system logs for this analysis.

Everyday use also showed that much of the office's demand consisted of predictable, recurring routines, such as reminding of deadlines, announcing events and repeating notices. This observation, made from the suggestions received during the monitoring phase, guided the deployment of the proactive workflows described below.

4.2 Deployed proactive workflows

In the adjustment stage, five proactive communication workflows were developed and deployed. Table 2 summarises their configuration.

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Table 2 - Proactive workflows deployed at IFTO - Araguatins Campus

Workflow	**Data source**	**Sending rule**	**Recipients**
Announcement of institutional events	Event control spreadsheet (Google Sheets)	Daily query; single message with the day's events	Groups defined by the Communication Office
Announcement of undergraduate thesis defences	Thesis committee scheduling spreadsheet	Daily check; sent with scheduled lead time; includes student, title, time and virtual room link	Group of students of the Licentiate Degree in Computing
Birthdays	Staff birthday spreadsheet	Daily date check; group message, individual message to the private contact and institutional e-mail	Campus staff
Higher education academic calendar	Spreadsheet of institutional calendar milestones and deadlines	Daily check of the difference between the current date and the milestone; notices 15 and 7 days in advance	Groups of students and teachers of the course
Scheduled messages	Spreadsheet of messages scheduled by the communication team	Daily check at 9 a.m.; automatic sending on the defined date	Selected institutional groups

Source: Prepared by the authors (2026).

The first workflow posts, in the groups defined by the Communication Office, the events recorded in the control spreadsheet. The message gathers in a single block the date, the total number of events of the day and, for each activity, title, time, place, description and registration link (Figure 2a). The second workflow announces the undergraduate thesis defences recorded in the committee scheduling spreadsheet, with a scheduled lead time, stating the student's name, the title of the work, the time and the virtual room link (Figure 2b). Unlike the reactive service, these notices reach the groups without anyone having to request them.

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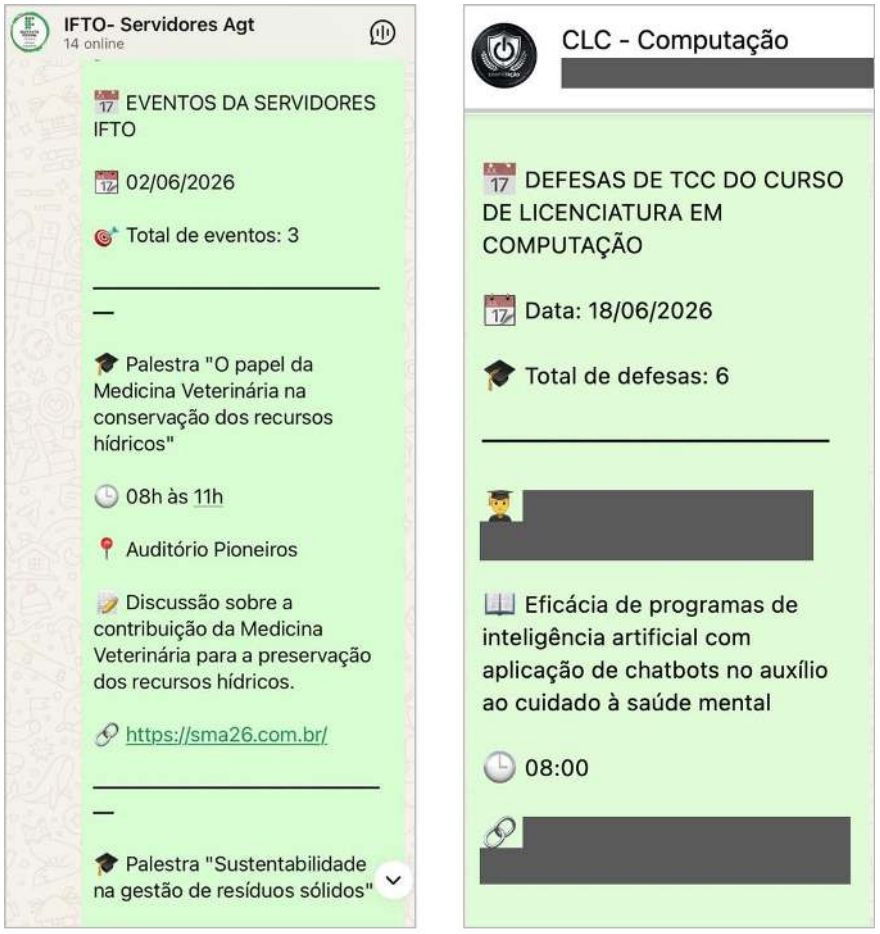
Figure 2 - Messages from the announcement workflows: (a) institutional events in the campus staff group; (b) thesis defences in the group of students of the Licentiate Degree in Computing



Source: Research data (2026). Cropped WhatsApp screenshots, kept in the original Portuguese; names of people, member lists and meeting links were hidden by the authors.

The third workflow queries the birthday data source daily and sends a group message to the staff group (Figure 3a), an individual message to the staff member's contact (Figure 3b) and a message by institutional e-mail. These records show that the messages were sent to the expected recipients on the expected date, but do not allow effects on the organisational climate or staff engagement to be assessed.

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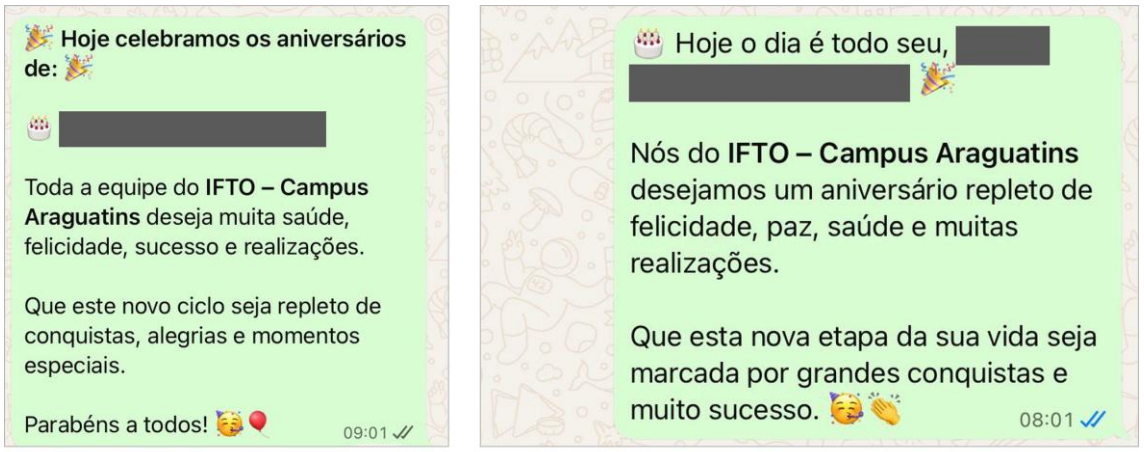
Figure 3 - Messages from the birthday workflow: (a) group message in the staff group; (b) individual message sent to the staff member's contact



(a) (b)

Source: Research data (2026). Cropped WhatsApp screenshots, kept in the original Portuguese; names of people, member lists and meeting links were hidden by the authors.

The fourth workflow tracks the milestones of the higher education academic calendar. A script calculates how many days remain until each recorded milestone and, when the difference reaches 15 or 7 days, sends a notice to the defined groups. Figure 4a shows two notices sent at the same time to the student group: a 7-day notice for the deadline for validating complementary activities (23 June 2026) and a 15-day notice for the end of the 2026/1 semester (1 July 2026). Figure 4b shows the 15-day notice about the end of the semester sent to the teachers' group. The same milestone was therefore communicated to different audiences, and the same workflow handled different milestones according to the lead time of each one. The workflow was designed to increase the advance notice with which the community is informed of deadlines; its effect on meeting these deadlines was not measured.

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Figure 4 - Notices from the academic calendar workflow: (a) 7-day and 15-day notices in the course student group; (b) 15-day notice in the group of teachers of the Licentiate Degree in Computing



Source: Research data (2026). Cropped WhatsApp screenshots, kept in the original Portuguese; names of people, member lists and meeting links were hidden by the authors.

The fifth workflow allows the Communication Office to schedule messages for automatic sending on a defined date, at 9 a.m., when the workflow runs; this workflow is not illustrated in the figures. The reactive mode features remained in operation: querying and updating spreadsheets, managing events, creating and updating calendar appointments, scheduling meetings with Google Meet integration and sending messages through the institutional Gmail. The proactive workflows were thus added to the natural language service, which remained available.

4.3 Comparison with related systems

Table 3 compares the developed solution with the systems described by Rodrigues et al. (2025) and by Fernandes and Silveira (2024). Only the characteristics reported in the respective publications were considered; when a publication does not address a given aspect, “not reported” is recorded.

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Table 3 - Comparison between related systems and the developed solution

Characteristic	**Sabiá (Rodrigues et al., 2025)**	**IFCE chatbot (Fernandes and Silveira, 2024)**	**Developed system**
Context	UTFPR, Dois Vizinhos Campus; academic questions about regulations	IFCE, Tianguá Campus; student assistance policy	IFTO, Araguatins Campus; internal communication
AI technology	LLMs with RAG (LangChain, ChromaDB); several models via OpenRouter, including GPT-4o-mini	Intent recognition (Dialogflow)	LLM (GPT-4o-mini) via OpenRouter in the reactive mode; scripts and templates in the proactive mode
Channel	Web application (Streamlit)	Telegram and WhatsApp, individual conversations	WhatsApp (groups and individual contacts) and e-mail
Messages sent on the system's initiative	Not reported	Not reported	Yes; daily scheduled routines (CRON)
Actions performed in other systems	Not reported	Not reported	Yes; calendar, e-mail and spreadsheets (MCP)
Institutional data used	Institutional regulations in PDF	Not reported	Google Workspace spreadsheets
Infrastructure	Models accessed through an API (OpenRouter); local execution of open models suggested as an alternative	Third-party services (Dialogflow, Make, Z-API)	Hybrid: self-hosted orchestration (Docker); LLM, Google Workspace and WhatsApp as external services
Audience	Students	Students	Staff, students and faculty
Evaluation	Textual metrics and LLM-as-a-Judge on a list of frequently asked questions; no user tests	SUS with 12 participants (88.75)	Qualitative observation in three real groups

Source: Prepared by the authors (2026), based on Rodrigues et al. (2025) and Fernandes and Silveira (2024).

The comparison shows that the solution brings together characteristics that appear separately in the works analysed. Like Sabiá, it uses language models accessed through OpenRouter to answer natural language questions; like the IFCE chatbot, it uses WhatsApp and a workflow automation tool. In relation to both, it adds the execution of calendar, e-mail and spreadsheet actions through MCP and

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the sending of messages on the system's initiative, including to groups, which reaches several recipients with a single message. The way answers are grounded also differs: Sabiá retrieves excerpts of regulations through RAG, whereas the AI agent described here queries spreadsheets through MCP tools.

The same comparison exposes limitations of this study. Sabiá was evaluated with answer quality metrics and the IFCE chatbot with a standardised usability instrument, whereas the evaluation reported here is restricted to the observation of operation. The procedure of Rodrigues et al. (2025), which compares the model's answers with a set of reference questions, could be applied to the reactive mode of the system. Conversely, Sabiá has not yet been tested with users, whereas the system described here operated in real groups of the institution.

4.4 Discussion

In the reactive mode, the MCP clients allowed the language model to call Google Calendar, Gmail and Google Sheets from natural language requests, which corresponds to the separation between the implementation and the use of tools described by Hou et al. (2026). The proactive workflows, in turn, are deterministic automations that share with the AI agent the same n8n instance, the same spreadsheets and the same messaging gateway. This division has a practical consequence: recurring messages, such as notices of events, deadlines and birthdays, have their format and content defined by templates and are not subject to the incorrect answers that Kayalı et al. (2023) point out as a risk in the use of generative models. The language model is restricted to interactions in which freely worded requests need to be interpreted.

The resulting architecture is hybrid. Self-hosting n8n, PostgreSQL, Redis and the Evolution API kept the orchestration, the conversation memory and the messaging gateway under the team's control, on a local server of IFTO, which is in line with the report by Pawar et al. (2025) on control over the execution environment. The other components are external: the data sources queried by the proactive workflows are in Google Workspace spreadsheets; the language model is accessed through OpenRouter, which acts as an intermediary between the system and the

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model provider; and message delivery depends on the WhatsApp infrastructure, accessed through the Baileys library. Since the proactive mode processes staff personal data daily, such as name, date of birth and contact details, and the messages received in the reactive mode are processed by the external model, this point is relevant for the analysis of compliance with the LGPD (section 3.8).

In the functional tests of the reactive validation, GPT-4o-mini extracted the parameters of the requests and performed the scheduling actions. Since the number of interactions tested and of correct results was not recorded, this result does not constitute a performance measure. It is consistent with the agreement between this model and human raters observed by Rodriguez et al. (2026), but the tasks are different, and the comparison indicates only consistency with the literature.

In the observed period, the announcement of events, the announcement of defences, the academic calendar reminders and the birthday messages, previously prepared and sent manually by the team, came to be sent by the automated workflows from the spreadsheet records. Manual work in these routines came to concentrate on entering and updating these records. The study did not measure the team's working time before and after the deployment and, therefore, the reduction in effort cannot be quantified. Korzynski et al. (2023) include scheduling, reminders and record keeping among the administrative tasks that generative AI can automate; in the case described here, the automation of dissemination routines was achieved mainly through scripts and templates, and the language model was used in the interactions that required interpreting requests.

In relation to the educational studies reviewed (Kayalı et al., 2023; Ilieva et al., 2023; Mendoza et al., 2022), which deal with chatbots used by students, the system described also serves staff and faculty and includes the sending of messages on the institution's initiative. Operation in three real groups, with different audiences, indicates that the solution is technically feasible under the campus conditions; generalisation to other offices and institutions depends on new deployments.

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4.5 Limitations

The evaluation was based on qualitative observation of the operation and on screenshots, and the number of interactions in the reactive validation was not recorded. No standardised usability or satisfaction instruments were applied, nor were the team's working time, the message delivery rate or effects on meeting deadlines and on participation in events measured. The deployment took place on a single campus, in three WhatsApp groups, over about two months. The context window of language models limits the processing of large volumes of historical data in a single interaction. Dependence on third-party services (WhatsApp, accessed through the Evolution API, Google Workspace and OpenRouter) introduces external points of failure; in the proactive mode, a sending failure may go unnoticed, because recipients are not expecting the message, which requires monitoring of dispatches. The Evolution API accesses WhatsApp through Baileys, an unofficial implementation of the WhatsApp Web protocol, which exposes the operation to changes in the protocol and to the blocking of the number by the platform. In data protection, the conversation history is kept in PostgreSQL with no deletion period, the legal basis of the processing was not formally documented, and the international transfer to OpenRouter and to the model provider is not supported by a specific instrument. In security, part of the restrictions on the use of tools, including the confirmation before deleting events, depends on the System Message, e-mails are sent without confirmation by the user, the Google credentials have full access to the account, and the system was not tested against prompt injection. Finally, part of the grounding on self-hosting n8n relies on a rapid-review technical report (Pawar et al., 2025).

5. Conclusion

This article described the development and deployment of an internal communication agent based on generative AI at IFTO - Araguatins Campus, an institution with a small team, high demand for information and limited infrastructure.

Regarding the research question, the results point to three elements. In the architecture, orchestration with n8n and MCP clients integrated Google Calendar,

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Gmail, Google Sheets and WhatsApp in a single environment and allowed the language model to perform actions from natural language requests. In the infrastructure, self-hosting the orchestration, memory and messaging components proved feasible with the available resources, although the data sources, language processing and message delivery depend on external services, which makes the architecture hybrid. In the automation, the five proactive workflows came to send notices of events, defences, birthdays, calendar deadlines and scheduled messages from spreadsheets and templates, with no failures observed in the event and birthday workflows during the period.

In the comparison with systems described in the literature, the use of language models (Sabiá) and the use of WhatsApp with a workflow automation tool (IFCE chatbot) appear in separate works, and neither of them describes the execution of actions in institutional services or the sending of messages on the system's initiative. The same comparison indicates the main points to be developed: the systematic evaluation of the answers in the reactive mode and the measurement of the effects of the automation.

As future work, the following are suggested: measuring the time the team devotes to dissemination routines before and after the automation; extracting delivery and failure indicators of the dispatches from the logs; applying standardised usability instruments to users of the reactive mode; extending the pilot to other offices of the campus; and evaluating locally executed language models, to reduce dependence on external services in the processing of personal data.

Declaration of generative artificial intelligence use

In preparing this manuscript, the authors used Claude, a generative artificial intelligence assistant by Anthropic, exclusively for correcting and revising the writing and for translating the abstracts and the full text into English, and the abstract into Spanish. No other artificial intelligence tool was used.

All content revised or translated with the support of the tool was checked and edited by the authors, who take full responsibility for the accuracy, integrity and originality of the work. The development of the system, the operational data, the

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interpretation of the results and the conclusions are the authors' own, and the tool is not listed as an author. The GPT-4o-mini model mentioned throughout the text is a component of the system under study and was not used to write the manuscript.

References

Fernandes, Leonardo de Almeida, and Francisca Raquel de Vasconcelos Silveira. "Desenvolvimento de um Sistema Computacional para Conversação sobre a Política de Assistência Estudantil do IFCE." *Revista Eletrônica de Iniciação Científica em Computação*, vol. 22, no. 1, 2024, pp. 128-36, https://doi.org/10.5753/reic.2024.3968.

Hou, Xinyi, et al. "Model Context Protocol (MCP): Landscape, Security Threats, and Future Research Directions." *ACM Transactions on Software Engineering and Methodology*, vol. 35, no. 10, 2026, pp. 1-37, https://doi.org/10.1145/3796519.

Ilieva, Galina, et al. "Effects of Generative Chatbots in Higher Education." *Information*, vol. 14, no. 9, 2023, article 492, https://doi.org/10.3390/info14090492.

Kayalı, Bünyami, et al. "Investigation of Student Experiences with ChatGPT-Supported Online Learning Applications in Higher Education." *Australasian Journal of Educational Technology*, vol. 39, no. 5, 2023, pp. 20-39, https://doi.org/10.14742/ajet.8915.

Korzynski, Pawel, et al. "Generative Artificial Intelligence as a New Context for Management Theories: Analysis of ChatGPT." *Central European Management Journal*, vol. 31, no. 1, 2023, pp. 3-13, https://doi.org/10.1108/CEMJ-02-2023-0091.

Mendoza, Sonia, et al. "A Model to Develop Chatbots for Assisting the Teaching and Learning Process." *Sensors*, vol. 22, no. 15, 2022, article 5532, https://doi.org/10.3390/s22155532.

Pawar, Saurabh, et al. "A Practical Evaluation of Self-Hosted n8n for Secure and Scalable Workflow Automation." *International Journal of Scientific Research in Engineering and Management*, vol. 9, no. 6, 2025, pp. 1-9, https://doi.org/10.55041/IJSREM50302.

Rodrigues, Guilherme Biava, et al. "Sabiá: Um Chatbot de Inteligência Artificial Generativa para Suporte no Dia a Dia do Ensino Superior." *Anais do XXXVI Simpósio Brasileiro de Informática na Educação (SBIE 2025)*, Sociedade Brasileira de Computação, 2025, pp. 1402-15, https://doi.org/10.5753/sbie.2025.12925.

Rodriguez, Joshua, et al. "Text Chunking in Human-AI Teaming of Document

REMUNOM
ISSN 2178-6925

Received: 15/10/2026 - **Accepted:** 11/11/2026
Vol: 13.24
DOI: 10.66104/2fxv0d97
Pages: 1-27

Classification for Urban Systems Management Using Large Language Models." *IET Smart Cities*, vol. 8, no. 1, 2026, article e70023, https://doi.org/10.1049/smc2.70023.