Prevention of Errors in "Real Time" using Model AI:

Improving Operational Efficacy of Student Information Systems (SIS) in an Educational Institution

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Abstract

The primary objective of this project is to evaluate whether implementing GoodRepsAI's product, known as ModelAI or ModelAI tool, can enhance operational efficiency by reducing errors within GAMA's (educational institution) operations. Specifically, this involves integrating ModelAI with the student information system (SIS) managed by GEGI, an educational technology company.

GAMA relies heavily on the system for necessary daily tasks to complete operations, including admissions, student services, academics, registrar functions, accounting, and financial aid. Unfortunately, GAMA administrators have consistently encountered operational errors while using GEGI SIS. Notably, GEGI's customer service representatives handle many support requests from user errors within GAMA's administration. Both companies grapple with managing repetitive errors impacts encountered while using GEGI SIS.

The focus of my investigation centers around determining if the ModelAI can effectively tackle the stated issue by seamlessly integrating into GEGI SIS to alleviate the reported operational challenges. The proposed solution entails leveraging the Model AI as a measure to recognize patterns and prevent errors before they arise. The expected outcome should provide recommendations regarding the feasibility and desirability of the implementation by stakeholders and partner organization as a solution.

Keywords: SIS, model AI, educational administration, digital technology, management model transformation, BPM, process mining, task mining, error management theory, logic tree, Fishbone diagram, TPS, ML, early adopters.

Introduction

Using informational technologies in educational institutions is an essential form of administrative management. The quality of information systems depends on how well the features are aligned with the strategy and operations of the organization that uses the system (Sedrakyan, et al, 2016). Administrators in educational institutions use information technologies to perform vital operational tasks, from transforming leads to students, managing the complete student lifecycle, and moving the students to alumni.

Academic administrators track student academic achievement, attendance, and grades. Accounting and financial aid representatives submit reports to accrediting boards and governmental entities using digital information technologies. The whole process involves many departments of educational institutions: from marketing, admissions, financial aid, accounting, and student services to graduate and placement departments.

Student information (management) systems (SIS, or SMS) aim to eliminate manual work and aid users in their operations by guiding them in preventing and/or fixing errors in real time. Such management technology automates operational processes and incorporates error messages made by users and informative prompts to guide them when an error has occurred. When errors persist, they create overhead costs for the institutions due to waste of resources, administrative user dissatisfaction, non-compliance with internal and external regulations, requests for troubleshooting, latency in duties and outcomes, etc. An example of a SIS is a company called GEGI. GEGI's largest client is an educational medical postsecondary vocational training academy, GAMA. GAMA uses GEGI SIS for its vital daily operations.

Both GEGI and GAMA frequently encountered operational inefficiencies, attributed by company representatives to the resources expended on troubleshooting recurring errors.

Both companies strived to improve the quality of their operations. Each company representative believed that the problem did not originate from within. GAMA's employees - administrators and faculty - believed the inefficiency of operations was caused by GEGI's usability, i.e., the architecture, logic, inflexibility or too much flexibility of features, etc. GEGI's staff members - customer support and project managers - believed that the fault was due to inefficient processes and inadequate training of users at GAMA.

In search for a solution to the issue, GAMA's Chief Operating Officer (COO) and the Chief Executive Officer (CEO) of GEGI familiarized themselves with a company named GoodRepsAI. Engineers at GoodRepsAI developed a tool designed to automate data-rich and fact-based backend operations in businesses, utilizing generative AI, particularly focusing on insurance companies. ModelAI is aimed at eradicating mundane tasks and streamlining processes by integrating the model into operational systems, such as customer relationship management software (CRM), for instance. The CEO of GoodRepsAI previously expressed a desire to "expand into new markets and implement the tool in different industries" (Prokhorenko, 2023) as the company's next growth phase. One of the potential expansion opportunities listed was the educational sector. However, there was a dearth of expert assessment regarding existing issues in educational institutions that could potentially benefit from their model solution (email correspondence, O. Prokorenko, 2023).

As part of the Capstone project, GoodRepsAI's CEO enlisted me to investigate the potential application of ModelAI as a solution to the existing operational challenges encountered by GAMA and GEGI. The value of the outcome of this investigation is multifaceted. The main value of this investigation for GoodRepsAI company is to assist expert subject information that

will allow the CEO of GoodRepsAI to understand if his product can solve the existing problems for GAMA and GEGI. I conducted the investigation in three phases.

Phase 1

I started by checking the mutual operational problem of both GAMA and GEGI. My investigation into processes in GAMA and GEGI allowed me to understand and formulate their main problem (s). The summaries of GAMA representative surveys and quantitative query reports prepared by GEGI SIS team helped me with this deep dive. I applied theoretical concepts to guide me through the process of problem evaluation. To investigate the problem, I used the PROACT® Root Cause Analysis.

Phase 2

During the second phase of my investigation, I examined concepts such as process mining theory, the system application of business process management, and operational workflows via information technology to delve further into the root cause of the identified problem(s).

Phase 3

The third phase of my investigation was dedicated to the applicability of the product by GoodRepsAI. Logic Tree diagram and Cost-Benefit Analysis based on sequential design of the process workflow drove my recommendations. The recommendations combined an understanding of the model's capability and compared it to other internal system improvement possibilities. During the investigation I committed to official face-to-face meetings, as well as consistent communication via chat, emails and google hangouts with all stakeholders.

Accordingly, my paper is organized as follows. Part 1 provides background information about the organization, system, and domain including the key stakeholders, and contacts. Part 2

is devoted to the problem statement, and key terms. It highlights the theoretical and practical literature used to understand the problem and the existing concepts behind the possible causes of the problem. Part 3 illustrates project design, project questions and methods used to conduct the investigation. Part 4 overviews the findings and discusses possible solutions. Part 5 provides logic tree, recommendations, and conclusions for the project.

Part 1: Organizational Context

This section provides detailed information about the organizations involved in my capstone investigative project, including their contact details and important organizational interconnections. It is crucial to grasp these dependencies before commencing the project review.

Organization Partner - GoodRepsAI

The main stakeholder representing my Partner Organization and directly participating in this project is Olexandr Prokhorenko, the Chief Executive Officer (CEO) of GoodRepsAI.

GoodRepsAI, a startup nearing the final stages of its market entry, offers solutions for addressing patterns of erroneous user behavior within specific technology systems. According to the company's CEO, O. Prokhorenko (personal communication, October 24, 2023), GoodRepsAI has been successful in mitigating such issues in the insurance industry and now seeks to expand its services to the educational sector. The company's website (https://www.goodreps.ai/#what) highlights its agent-based assistance capabilities, aimed at streamlining repetitive, time-consuming, and data-intensive process flows within systems.

GoodRepsAI analysts (email correspondence, O. Prokhorenko, October 24, 2023) predict that educational space will work like the proven concept of their tested insurance space. Based on the discovery insurance agents spent 60 to 70% of the time on support and service. GoodRepsAI is estimating conservative 50% and 50% of these can be deflected from the support pipeline requiring manual work and assistance. Thus only 25% to cost reduction for staff which is about $18,000 a year for small scale insurance companies. These resources redeployed towards revenue generating activity create a larger financial opportunity. Applying similar thinking to the educational industry, the scale seems to be even larger. Prokhorenko (meeting, November 20, 2023) during our initial meeting indicated that an essential task is to understand if

there is a value for an educational private technological company and its clients to adapt new technologies, such as their ModelAI at an early stage. This will likely provide him with reasons to invest in the educational technology industry.

Using Large Language Models (LLMs) GoodRepsAI executives think they may help educational institutions in administrative operations. Educational institutions use student management systems to manage their operations. These systems are referred to as Student Information or Management Systems (SIS or SMS for short). Using their method and creating AI assistants for the use by system users there is a chance for the educational institution to eliminate cost and improve the efficiency, effectiveness, and efficacy of its operations. However, the company needs proof of concept to be able to invest in the next industry. Research and development are an investment. To approve the cost, GoodRepsAI's CEO, (meeting, O. Prokhorenko, November 20, 2023), needs an expert evaluation report from an educational domain to verify the concept's possibility to expand.

Educational Domain – GAMA

The Chief Operations Officer (COO) of GAMA and direct participant in this project is Burke Malin.

GAMA is a post-secondary private medical vocational trade academy headquartered in California, with six physical locations and an online presence offering clinical on-ground training across the nation. Established in 2004, GAMA provides associate's, bachelor's, and master's degree programs, serving a diverse population of over three thousand students. The academy utilizes GEGI as its student information system (SIS), through which various department representatives primarily handle operational tasks.

GoodRepsAI's CEO, O. Prokhorenko (personal communication, October 1, 2023), approached GAMA’s COO, B. Malin, offering to test the applicability of the GoodRepsAI model in the academy’s environment. During the initial stakeholder meeting (November 20, 2023), Malin shared that the academy faces challenges with persistent errors in its operational workflow using the Student Information System (SIS), GEGI. GEGI serves as the primary tool for managing GAMA’s operations, aiming to automate processes and eliminate manual tasks while providing customizable tools. The system's regulations and guidelines govern various aspects, including reporting, administrative activities, and daily operations, facilitating collaboration among departments and systems to ensure efficient service delivery to teachers, students, staff, and the institution.

System – GEGI SIS

My stakeholder and the direct participant of the project representing the GEGI SIS is the Chief Executive Officer (CEO) Vitaly Golban.

GEGI student information system governs the flow of operations in educational organizations. Users of the system include the registrar's office, admissions and financial aid, front desk and student services, accounting and business, students, faculty, administrators, data analysts, outreach, IT, etc. In most private and public educational institutions today, the SIS is either an enterprise solution, meaning one platform for all vital operations, or a platform that is connected to many different platforms to synchronize information and produce automated student record retrievals and management. Another option is customer relationship management (CRM), which refers to software as a set of data-driven solutions to help manage, track, and store information related to current and future students.

GEGI's website (https://www.gegi.co/) describes its product as an enterprise SaaS solution, which means that the company also offers support services and software. The system was originally built "in-house". This means that the system was structured following the business strategies and operational flow of one educational institution. GEGI is a fully integrated student management platform, which means that it supports educational institutions in all operationally vital tasks. The company has been in operation since 2007. Since 2018, GEGI has been a privately owned tech company that offered its services exclusively to one institution. In 2022, it has announced plans to expand its client base. At the start of 2023, GEGI signed new contracts with other schools and organizations. GEGI has a deep understanding of the challenges, primarily in private post-secondary schools.

Statement of positionality

To conduct this investigation, it is vital to note my relationship with the partner organization and the collaborating stakeholders. All involved parties had previously agreed to use my services to evaluate the concepts described above in the form of my Capstone project. GEGI SIS was used for anonymous data collection purposes. To avoid any possible harm to direct or indirect participants or to prevent any validity concerns, I took careful steps when designing this investigation. The design section described such steps in detail.

Part 2: Background, Problem Statement, Literature Review

In this section, I provide an overview of my project's background, outlining key stakeholders and their roles, along with potential research implications. I introduce key terms and discuss research and other literature, dividing my investigation into three phases guided by the PROACT Root Cause Analysis by Latino et al. (2020).

Background

For the past two decades, I was involved in shaping the strategy and fostering innovation at GAMA, an educational institution, since its inception. My contributions extended significantly to the design and development of the Student Information System (SIS) currently used by GAMA. Over time, my role evolved into an executive position with a focus on hands-off consulting. Concurrently, I pursued further academic endeavors by enrolling in a doctoral program at Vanderbilt, delving into the theoretical realms of leadership and organizational learning.

Throughout this journey, I kept the board of directors at GAMA apprised of my academic progress and interests. Recently, a board member suggested my involvement in their possible collaboration opportunity with GEGI LLC and GoodRepsAI. Intrigued by the challenges they faced and recognizing the alignment of my expertise with their needs, I agreed to their proposal to apply my Capstone project and partner with GoodRepsAI in their investigations. I provided expert resources for investigative purposes the partner organization, along with the stakeholders sought in this domain.

Problem Statement

To aid GoodRepsAI company in investigating major problems and lack of solutions in educational technology, I narrow my query into main instigative questions, which I will provide later in this paper. GoodRepsAI aims to explore the educational technology field and assess the applicability of their product. Their tool seamlessly integrates into email conversations, auto-generating drafts of responses to sales and service inquiries. While initially focused on solving customer support challenges in the insurance industry, GoodRepsAI now seeks to diversify its offerings.

Expert validation is crucial to determine whether GoodRepsAI should: Invest further in research and development resources in the educational technology field; Explore alternative solutions or rework existing tools based on identified problems.

The development of my main questions is based on the following pattern of framing:

- Current Educational Technology Landscape - What technologies do educational institutions commonly use? What patterns of needs and challenges exist in educational settings?
- Relevance to Educational Company - Within the educational field's expert validation domain GoodRepsAI has chosen GAMA, a private educational institution using the student information system (GEGI SIS), for investigation. What has been done to address major problems? If there is a phenomenon of similar errors occurring either from user's or system's side (or both), how were these errors managed / prevented? Can GoodRepsAI's model address problems within the educational field, specifically integrating their ModelAI into educational technologies and organizations, such as GAMA/GEGI?

GAMA uses a student information system (GEGI SIS) for their daily repetitive tasks. My investigation explores the educational student management process for answers that will inform the strategic decisions of GoodRepsAI in potentially leading to alignment with their current capabilities, the need for new problem-solving tools, or a pivot toward their model.

The CEO of GoodRepsAI proposes that his company's value is in providing a tool that can address persistent requests stemming from repetitive errors. The CEO needs to know if the same can be done within GAMA's usage of GEGI SIS and understand the value of the solution for GAMA and GEGI. ModelAI aims to alleviate the administrative burden associated with these tasks by learning from user errors and providing suggested steps, very similar to an idea of an autocomplete feature – however in the case of GAMA the same is to serve the tasks. The envisioned approach involves granting GoodRepsAI access to the student information system for AI model training. The primary envisioned goal is for the model to proactively prevent errors in real-time, providing support to users during their tasks. Yet, achieving this objective requires resources. To understand the feasibility and calculate the return on investment on research and development, along with potential redevelopment of the tool, Prokhorenko requires additional information.

The persistence of errors is not only a pain point for institutions like GAMA, and it is tied in with a financial burden. It is important to validate and measure the assumption of the burden into real numbers to understand and measure the impact of the problem. GoodRepsAI is working with systems like GEGI to improve the troubleshooting process, removing the errors, before they even occur, thus eliminating the resources used to troubleshoot. The built in customer service ticketing system within GEGI is used to troubleshoot the errors that occur using the system. The urgency for GoodRepsAI to evaluate the findings is critical. Timing plays a vital role in the

comparative advantage of the company to apply the method, test, and be able to scale. GEGI is planning to increase the cost of the support services to help with the ticketing system. This has been done annually and did not contribute to the decrease in the number of requests. Thus, it is essential to solve the errors as they are created by preventing them from occurring through guided prompts.

Based on the preliminary discussion, GEGI / GAMA noted challenges in admission processes, specifically during the enrollment of the students. The interdependence of actions between Admission Advisors (AA) and Financial Aid Advisers (FAA), together with delays in resolving errors through support tickets, creates bottlenecks that hinder the enrollment process. The proposed solution involves implementing a model that learns user behavior patterns to guide real-time error correction, preventing bottlenecks, and serving as a training tool for administrators. This aims to streamline processes and enhance the efficiency of enrollment procedures in educational institutions.

Like the previous example, incorporating the capability to guide users, such as Admission Advisors (AAs) or Financial Aid Advisors (FAAs), during the enrollment process is expected to reduce the time spent on request, review, approval, training, and implementation. This reduction minimizes resource expenditure for the institutions involved. GEGI SIS Customer Service team can allocate more time to urgent requests, while the GAMA's users gain efficiency in the process, allowing for increased time spent with students.

During our meeting on November 20, 2023, Malin conveyed those educational institutions, such as GAMA, and numerous technological companies operating in the educational sector, like GEGI, are confronted with frequent errors, resulting in elevated support costs and resource wastage. The urgency for adept professionals to mitigate these errors is paramount. The

project holds significance in promptly implementing, training, and deriving value from the model without expending resources linked to human labor. This prompts inquiries into the existing technologies, system attributes, and the evolving methodologies required to address the persistent issue of errors and resource inefficiencies.

Literature Review

Delving into theoretical and practical concepts, I came across research in business process and workflow management via information technology. These theories had long been concerned with the challenge of reducing the administrative burden caused by persistent errors in institutional process workflows and automating standard operating procedures to free up users for more crucial tasks.

Considering recent advancements in Language Model (LLM) and Artificial Intelligence (AI), it became crucial for companies to explore early adoption and invest in research and development in this field. Understanding this could help the CEO of GoodRepsAI with his value proposition. Questions arose about the early involvement of educational institutions as well as educational technologies in this domain and how to minimize learning, psychological, and compliance costs linked to administrative burdens described above. With these considerations, my investigation delved into the problem, drawing on prior literature to support my investigation and recommendations.

Phase 1 - Understanding the Phenomenon - Literature Grounding

According to Latino (2020), the initial phase of evaluation begins with Preserve, serving as the first step in any critical evaluation process. This phase entails gathering all necessary documentation to provide factual support for the identified dual organizational problem: the persistence of errors. To substantiate the assertion regarding the existence of this phenomenon of

persistence of errors, it is imperative to thoroughly examine and validate the problem. The primary focus lies in confirming the existence of the problem, and pertinent literature is relied upon to steer the investigative process. The errors under analysis may stem from system or user error, or a combination of both. System errors refer to errors created due to flaws in logic, process, or setting—a phenomenon often described as a "bug." The term "bug" has its origins in technological companies, with quality assurance engineers using it to characterize errors arising from system logic. This term traces back to Thomas Edison, who used it 140 years ago to describe a flaw in the design or operation of a technical system (https://spectrum.ieee.org/did-you-know-edison-coined-the-term-bug).

In my project's context, the term "bug" refers to a confirmed flaw in system logic, while "human error" denotes activity performed incorrectly by a human agent or user, such as deviating from specified procedures. To analyze error nature, Error Management Theory (EMT) will be employed. EMT, discussed in "Action Errors, Error Management, and Learning in Organizations" (2015), serves as a framework for comprehending how organizations perceive, respond to, and learn from errors. According to EMT, errors are unavoidable in human behavior, prompting individuals and organizations to develop adaptive mechanisms for error management. Understanding if the organization has implemented effective measures to mitigate errors is crucial in grasping the recurring error phenomenon.

Frese (1991) introduced the concept of error management as an add-on strategy to error prevention. Error Management theory is “a second line of defense.” Frese & Keith (2015) argue that “we can never completely eradicate action errors” and that “error management is an active approach to errors that reduces negative error consequences and enhances positive effects, such as learning and innovation (662)”. Error management involves coping with errors to avoid

negative error consequences, controlling damage quickly (including reducing the chances of error cascades), and reducing the occurrence of errors in the future (secondary error prevention) as well as optimizing the positive consequences of errors, such as long-term learning, performance, and innovations (665). For action errors and their consequences, the context matters (Goodman et al. 2011); therefore, error occurrences are often investigated in applied field studies rather than in highly controlled and possibly artificial experimental settings (663). Standard Operational Processes (SOPs) represent the procedures that users of the student information system and GAMA employees must follow to achieve desired objectives. SOPs are documented manuals found across various departments, serving as frameworks for organizational action by providing direction and structure. They delineate what, how, when, why, and who is involved in each process (Iowa State University, 2010, as cited in Akiar, 2012, p. 13).

Utilizing and enhancing SOPs enhances quality by ensuring consistent implementation of processes or procedures within the organization, thereby reducing work effort and enhancing data comparability, credibility, and legal defensibility (Almeida, S. L., as cited in Akiar, 2012, p. 13). SOPs may vary in detail and step-by-step descriptions based on whether processes remain consistent across all scenarios or vary depending on individual circumstances. For instance, in an online educational platform (LMS), SOPs for instructors creating courses or duplicating templates typically offer comprehensive instructions. However, procedures for admissions or financial aid advisors during the enrollment process may be less straightforward, as each step depends on individual circumstances, such as student eligibility for credit granting, necessitating different actions for specific scenarios.

Phase 2 - AI's potentials in Educational Technology

The second phase of the evaluation process includes steps Organize and Analyze per PROACT guide (Latino, 2020). If the error management process is well maintained, but there is a consistent flow of similar errors, why do users continue to experience errors? Is the nature of errors technological, i.e. system usability? Is it in human workflow and processes? If the flows are in user error management of the organization, this may present a different set of questions focusing on the human element of the processes. In my project's context, GoodRepsAI was trying to understand if their model could solve consistent errors based on the exact protocol of operational steps and predict that the user is making an error. Consistent errors are based on the exact protocol of operational steps and predict that the user is making an error. By prompting the user to act the correct way, the model thus prevents the error from taking place and trains the user in the correct steps. This is based on business processes managed (BPM) and provided by the institutions.

What is the business process? It is a standard practice of operations that the users must perform to get to a goal. Aalst, et al (2016) describe how essential the BPM is to the organizations in their work *Business Process Management, Don't Forget to Improve the Process!* They write that in both academic discourse and industrial practice, there is a notable disjunction between the advancements in Business Process Management (BPM) technologies and methodologies and their adoption in practice. While BPM tools and approaches continue to evolve, their integration into practical use stays behind. For instance, despite the availability of BPM systems, only a minority of organizations utilize them for automated process execution, with many processes still hardcoded within various applications. It's crucial to recognize that BPM encompasses more than just the use of specific systems; it entails managing processes within environments where documentation may be incomplete, and diverse information systems

are employed, often operating without awareness of the processes they support (Aalst, et al., 2016).

Application of the BPMs in GAMA was essential to understand for this project. Steps to perform the operational actions are usually specified somewhere in different types of documents, such as manuals, handbooks, etc. In other words, in standard operational procedures (SOPs). For help I, tapped into the theory of Process/Workflow Mining to uncover the flaws in organizational practices. My intention to use process mining theory was to discover and understand practices behind the persistent errors. Were the established operational processes using the system based on the business strategy? Or were the users working around due to the flows or inflexibility of the system features?

Per Aalst (2016) the operational process is the key to setting up the system. Applied to GAMA this also means that any system such as GEGI or ModelAI should center its logic around the operational process of GAMA. What was the operational process of GAMA? It is a standard practice of operations that the users must perform to get to a goal, for example: enroll the students, sign the disclosure, correct the attendance, etc. What is the workflow process and the business process management of the educational organization? “Business Process Management (BPM) can be seen as an evolution of the concept of the WFM” (van der Aalst, 2013). Workflow Management (WFM) centers on the automation of business processes, while BPM usually doesn’t require new technologies. Aalst, et al. (2020) discuss the reason why process mining is a key in understanding the management of the workflow and businesses, as the administrators may hit on ideas on how to reduce cost while improving the services, either with new technologies and software to control and support the operational processes or without.

I started looking for help from research and other literature to understand if there is a significant potential for enhancing student management system effectiveness in education by integrating AI technology. Most of the literature on AI integration into educational technology is concentrated on integrating diverse AI techniques into STEM educational systems. Integrating diverse AI techniques, a systematic review from 2011 to 2021 examined 63 empirical research studies and highlighted AI's academic and technological implications for education (George & Wooden, 2023). I found almost no research on AI integration with Student Information Systems, with the focus on administrative management processes. Most research reviews AI as an enhancement for personalized learning and adaptive assessments, but not in the management of efficient administrative operations in educational institutions. Some articles and reports, such as the US Government's report titled Artificial Intelligence and the Future of Teaching and Learning, recommend fostering collaboration between educators and AI developers and investing in AI research and development (Cardona et al., 2023). AI technology has a huge potential for enhancing educational management platforms to improve efficient management processes.

When before, it was a human error, i.e. the user forgot to add the profile to the database, now the type of error becomes more ambiguous, one could argue this is usability or workflow problem. The collaboration between platforms or departments based on the strategy of the organization faces significant growth in product complexity today (Bardoscia et al. 2017). The investigation of the type of errors, system, or human is now taking longer time, as the complexity increases due to different modes of operation. Similarly, GEGI SIS is based on the dynamic processes of the business. There is a consistent need to optimize processes. Thus, the platforms must continuously change and adapt to changed strategies and processes. Relevance of the data

that is input is essential. The prevention of errors depends on expert understanding and competence of the users and the systems used, as much as it is in richness of data and patterns of behavior.

Scalabrin et al. (2019) describe that process mining can “obtain a meaningful process model extracting it from temporal documents or event logs readily available in system databases" (p. 260). Understanding if the processes at GAMA and GEGI are driven by a detailed workflow management system, patterns of actions and steps uncovering documentation that describe such workflow is the main goal of the use of process mining in this paper. If the result of this investigation showed that there was a scalable pattern of steps that can be taught to the AI model, the automation of such processes could lead to optimization and productivity improvement. Van der Aalst (2022) discusses that if the process is normative, that is if it is possible to find patterns of modeled and observed behavior, the undesired behavior is a deviation (p. 6). In this case, the undesired behavior is the user’s action that is outside of the predicted correct behavior.

Another essential research in the world of literature in the second (and third partially) phase of my investigation is delving into the topic of third-party intervention between the SIS and educational institutions. A third-party servicer (TPS) refers to an external company or individual who performs services on behalf of the academic institution. These services include Title IV Financial Aid platforms, administrative processes, and student management. These TPSs often rely on SIS platforms to manage student records, enrollment, financial aid, and other essential processes. The US Department of Education's guidance emphasizes the benefits and challenges. Please refer to Appendix A. Table 1 Third Party Servicer for visual clarity.

Phase 3 - Value of Innovation for Educational Companies

The last phase of the project was driven by dynamic Logic Tree Diagram. Given the partner organization's business model, it was important to identify in which capacity the partner would service GAMA and GEGI. The model AI implementation into the SIS could qualify as a TPS. My literature analysis was based on the research of third–party intervention ability to enhance efficiency and expertise in managing educational institutions operations. I reviewed sources based on available research articles and reports, guidance from the US Department of Education, and a few institutional case studies. Based on the guidance from USDE, institutions can benefit from the intervention from third parties by leveraging external expertise and services (GEN-23-03, 2023). When researching the impact of the TPS on administrative efficiency, data management, and student support, George & Wooden (2023) explore the innovative institutions with AI incorporated in technologies and claim that they can reshape the administrative processes and overall economic performance. There are pitfalls associated with this strategy, like privacy and safety, job security, bias, etc., and they critically evaluate the strategic adoption of AI in the framework of “smart universities”.

Baer et al. (2021) emphasize the importance of data analytics in recognizing institutional barriers impacting student success. They argue that institutions can use data to pinpoint support and practices that can improve both institutional and student outcomes. They assert that maintaining a data-driven system is crucial for organizational health.

Parycek, Schmid, and Novak (2023) delve into the potentials, limitations, and framework conditions of Artificial Intelligence (AI) and automation in administrative procedures. The authors emphasize the need for thoughtful evaluation, transparent practices, and ongoing monitoring to harness AI effectively in the administrative context. The key points discussed in their work seem to indicate the importance of integration and potential in revolutionizing the

current processes through a comprehensive evaluation of the model capabilities and limitations, data availability, and validity of predictions (this is important at the initial stage of the model AI algorithm development and training data).

Despite efforts to find relevant precedents in similar educational contexts (I used all AI search capabilities as well as traditional search options) for student management systems, my literature research did not yield significant results. Studying case studies on successful and failed AI implementations in educational technologies has provided, however, valuable insights into the current landscape of AI integration. For instance, a case study involving a midsized company showcased a significant % reduction in operational processing time by 50%. (ThinkML, 2024). Such examples illustrate how AI applications, ranging from payroll automation to virtual assistants, enhance productivity and effectiveness.

While exploring instances of failed AI integrations, specifically within educational settings, I encountered no examples. However, outside the educational niche, cases such as Air Canada's Chatbot misinformation (Drapkin, 2024) and X-blocking Taylor Swift Searches (Olavsrud, 2023) serve as cautionary tales. These instances underscore the critical importance of rigorous testing, ethical considerations, and transparency when integrating AI into systems, offering valuable lessons for organizations aiming for successful AI implementation.

The focus of my analysis and subsequent report of findings with recommendations came from scientific literature exploring the cost and benefits associated with another important aspect: the early adoption of AI and ML innovations as a business strategy, particularly for small to medium-sized companies (Nafizah et al., 2023). According to Suarez and Lanzolla (2007), there are three primary sources of first-mover advantage: economic, internal capability, and market-environmental advantages. However, early adopters face higher risks due to investment costs and

technological uncertainties. They may also encounter the "free rider effect," where competitors implement similar technologies at lower costs and imitate their success.

Conversely, these disadvantages may serve as advantages for second movers, as delaying adoption allows for the spillover effect and reduces adoption costs (Hoppe, 2000; Yoon, 2009). Yoon (2009) suggests that as more firms adopt the same technology, potential profits decrease due to increased competition. The author argues that informed firms may delay adoption to prevent spillover, anticipating the intentions of less-informed competitors. Meanwhile, Hoppe (2000) proposes that a slight increase in the probability of success can transform the waiting game into a preemptive strategy.

Part 3: Conceptual Framing, Project Questions, Design, Data Collection

This section details the methodology used to structure the evaluation process, including the utilization of an evaluation guide to address key questions, project timelines, data sources, and necessary activities for quality assurance. Additionally, it explains the rationale behind employing a framework and logic tree to align with project objectives. Part 3 serves as a roadmap for subsequent detailed discussions on findings and outcomes.

Conceptual Framing

My investigation was guided by the PROACT® Root Cause Analysis framework, developed by Latino et al. (2020). I used this framework as a guiding base to investigate and validate the problem(s) identified by the participants. This guide presents a reliable approach for evaluating the problem, offering ample information for GoodRepsAI to decide on diversification. However, the absence of expert understanding regarding the issues faced by GAMA and GEGI undermines the rationale for my partner organization to transition into the educational sector, see in Figure 1. Conceptual Framework in Appendix B for Conceptual Framework Diagram.

Per Latino et al., (2020) identification of the problem is the first requirement of the investigation process. The authors note that somewhere in the range of 80% of the time when they are asked to investigate the problem, the problem doesn't exist. For the company to investigate if the model can be applied, it needs to prove the existence of a valid problem before exploring its ability to improve the efficacy of administration in educational institutions. Latino et al. (2020) provide analytical tools necessary to perform a due diligence analysis. The following steps helped me guide my investigation. Please refer to Appendix C. Figure 2. Process Flowchart Diagram, for a visual representation of the process flow of my investigation.

Preserve

During this step, I decided on the methods of collection of the documentation, designed the schedules and meetings with participants, discussed the ways to categorize the needed information. Surveys and interviews helped me narrow down and define the problem that both companies experience, try to solve and are not able to do so using their own resources. Based on the preliminary understanding, the problem both companies continue to experience is the pattern of errors users face when performing essential tasks via GEGI SIS. I reviewed the means of how to identify, collect and verify the problem. I collected and sorted, filed, and retained the essential data to help order the errors per frequency of occurrence. If such information was not available through the requests, reports, or had technical limitations, such as the company didn't use tagging, classifications, etc. in their request process, I used other additional data that could help transform it into a quantifiable report. I used three Ps from five P's approach identified by Latino (2020) to help me with this step.

The five P's stand for: Parts, Position, People, Paper, Paradigms. The necessary Ps applied in my investigation are *People* (identified as participants – those individuals who are the experts: technical, support and operations representatives, as well as the leaders); *Paper* (the reports, logs, documentation, emails, meeting and focus group minutes, etc.) *Paradigms* (foundation of understanding how the processes work).

Organize

Once the information was collected and preserved, I analyzed the information and ordered the findings by grouping and classifying the errors per title of the error and frequency of repeated requests.

Analyze

Employing focus groups and engaging in discussions with the Customer Service Team and COO of GAMA, I conducted data analysis by constructing a logic tree to ensure thoroughness and mitigate potential oversights. The logic tree helps prevent overlooking any aspects that we might have otherwise noticed. For this phase, I used a logic tree diagram to organize the data collected and visualize it for ease of comprehension, which helped inform the decisions the stakeholders and partner organizations make based on my findings.

The recommendations were formulated based on a broad comprehension of the available data and a comprehensive review of the subsequent stages of the investigation. Given that my project is a component of a larger initiative, my report's culmination is dependent on the investigation's outcomes. During this phase of the project, my main examination relies on the actions undertaken by the direct participants through continuous communication and tracking measures. More on that will be discussed in Part 5.

Communicate

As per our established protocol, I periodically communicated and discussed my findings, following which the stakeholders act in accordance with the insights provided. Consequently, the final discourse within the Capstone project is contingent on the actions taken by the direct participants from the companies following each meeting with me. I used consistent meetings with GoodRepsAI, and other identified participants to discuss ongoing updates and findings. Based on the periodic and frequent meetings and discussions of the findings, I adjusted the plan of investigation to provide more thorough findings. The Logic Tree also follows the adjustments based on the findings and the discussion outcomes.

Track

During this phase I triangulated the data found and reviewed the findings with those from the GEGI Customer Support Service team. My findings, the analysis, and the summary of this phase helped me answer the project question: Does the evaluation lead to proof of concept? I merged the data in this phase to the concept of model AI to further understand if the current technological capability of model AI solves the validated problem. Further investigation is needed to understand the cost and the benefit of the model AI application, as well as comparative analysis of the current market technologies available. Per GoodRepsAI, there are currently no alternative models on the market pertaining to solving the problem of persistent errors in educational operational administration using the student information system.

During the Tracking stage, which is the current continuous step, the objective is to understand how GoodRepsAI could justify the cost of their solution in comparison to other alternative options, if any. If there were no alternative solutions or if the alternative solutions render a higher cost of execution / lower return of investment, then further investigation would need to be instigated. This examination is based on an understanding of how innovation investment in small educational technological businesses such as GEGI SIS is necessary for sustainable growth, comparative advantage, and value to current and future customers. To understand the value of GoodRepsAI's product across several dimensions, it is important to measure the success of Model AI integration.

The key considerations of my project investigation includ problem validation, ability for the Model AI to reduce errors, enhance efficiency, satisfy clients, distribute workload, savings, and long-term impact. Important to note that the success is about technical metrics and the alignment with the organizational goals and enhanced user experience.

Project Questions

Considering the concepts outlined above, this capstone project aims to answer the project questions, as noted below. Investigating and answering these questions will allow my partner organization to dig deeper into the narrow-specialized domain to understand the problem, its root cause and if the model AI is the (only and best) solution to the problem.

Question 1

1. Does the evaluation affirm the presence of the phenomenon of an ongoing problem?
    - 1.1. If not, what factors contribute to its absence?
    - 1.2. If yes:
    - 1.3. What are the root causes of the errors?
    - 1.4. What measures were taken to address these persistent errors?
    - 1.5. Can the AI model algorithm effectively resolve the issue?
    - 1.6. Are there alternative solutions available for the current problem?
    - 1.7. Do the errors stem from technological issues?
    - 1.8. What role does the GEGI SIS play in this problem?

Question 2

2. In what ways does GoodRepsAI's ModelAI allow GAMA/GEGI to respond to the problem identified?
    - 2.1. What are the primary error categories identified?
    - 2.2. What percentage of persistence do the errors exhibit?
    - 2.3. What is the labor cost associated with these errors for the institution and organization?

2.4. If GEGI enhances usability or incorporates built-in logic, can the problem be eliminated?

2.5. If changes in processes through training and workshops are implemented, can the problem be resolved?

2.6. Applicability necessary requirements: Is the process for modeling correct behavior outlined in standard operating documents?

2.7. Which documents outline the model behavior?

Project Design

This section details the structure of my investigation's design. This segment serves as a framework, delineating the project's timeline, data sources, essential activities, and any required participatory involvement. The evaluation is structured into three distinct phases: validation of the Problem, Analysis of Problem Management, and Evaluation of the Findings.

Participants

There are two types of participants in my investigation: direct and indirect. Direct participants are those whom I work with, and indirect participants provide information asked by the direct participants. By creating the hierarchy, I was able to ensure the anonymity of the users. I didn't participate in selecting the indirect participants because this project was already in the works, and the main stakeholders were already working with the indirect participants, trying to understand what needed to be done for the evaluation to occur.

To ensure anonymity and prevent conflict of interest regarding possible bias during data collection, data analysis, and interpretation, I ensured the integrity of the anonymous information through a review of the data that doesn't have any identifiable information related to any employee of GAMA or GEGI. The reason for the expertise and knowledge of the processes is to ensure the validity and reliability of the problem discussed by both companies.

Four GAMA Departments and one GEGI Department participated in the investigation, for a total of twenty indirect participants. The main stakeholders did not change any existing processes and schedules. The questions asked were already the current topics of their meetings. The information requested did not create extra work for any of the participants.

Data Collection and Analysis

I analyzed the data to determine if GoodRepsAI could solve the ongoing problem for GAMA/GEGI and, if yes, how it would add value to either organization or both. The initial data showed that both companies allocated significant resources to addressing consistent recurring errors. As an added side benefit, this evaluation helped GEGI and GAMA assess whether implementing GoodRepsAI was feasible. Evaluating my findings encompassed additional advantages for the educational technology company. Collaboration with GoodRepsAI and this investigation could prove advantageous for both GEGI and its clients.

The project's design was based on organized and classified data collection that provided qualitative and quantitative structured information to answer the main questions. I provided queries for semi-structured surveys, interviews, and questionnaires for the focus groups. Direct participants, the GEGI CEO and the COO of GAMA lead surveys, interviews, and questionnaires among their respective teams, referred to as indirect participants, for this investigation. The direct participants conducted these activities with their teams using Google channels, such as chats, hangouts, and space. Ongoing meetings were already focused on the persistence of errors and the hours spent on them. The direct participants summarized meeting minutes to address the questions in the templates provided. Direct Participants collected the data through surveys, interviews, and summaries and created summary reports from Freshdesk used by GAMA and GEGI SIS. I narrowed the processes per behavior to analyze the deviation from the model behavior.

I designed the process such that I received brief, anonymous reports from direct participants, summarizing the top persistent errors in standard operational procedures and the time spent addressing them. These reports, presented in an Excel template, for example, meticulously omit personal information or any data revealing the identities of participants or

system users. Indirect participants typically complete these templates as part of their regular duties, sending them to direct participants. Direct participants then compile and transmit the summarized information to me.

I also designed a format for surveys that avoids looking for identifiable data. The process of survey management and submission is analogous to the reports above. Indirect participants fill out surveys, which are then submitted to direct participants for summarization before being sent to me. This survey data is also securely stored on my computer.

All information remains confidential and is not shared with anyone outside the data collection process. However, most reports and interview data convey common knowledge and present a summary of reclassified and reorganized lists for evaluation purposes. The final dataset is securely stored in my email log on my computer.

Phase 1. Preserve. Problem Validation

By identifying and confirming the existence of the problem, my evaluation intended to:

- Offer GoodRepsAI an expert analysis of the educational, technological problems based on a specific educational organization.
- Provide an expert analysis to determine the tool's applicability as a solution in the educational field.

In the initial phase, the Problem Validation Phase, during the Preserve step, the PROACT method was employed to seek data validating the notion that the GoodRepsAI tool could potentially address the phenomenon of persistent errors. My goal was to confirm the existence of a persistent issue characterized by consistent errors. This inquiry resembled a Proof of Concept (POC) process involving direct participants in gathering feedback. Proof of concept is deemed critical across various fields, such as technology, business, and research, as it helps stakeholders

assess a proposed concept's potential success, risks, and challenges before full-scale development or implementation. Detailed data was required from the direct participants, which was organized in summary format, removing all personal information identifiers. C-levels selected for their surveys are indirect participants with relevant expertise related to the product domain. Their perspectives provided real-world insights into the problem, its causes, and possible solutions.

Error persistence, as defined here, refers to the recurring errors consistently encountered by users or systems. For example, in the enrollment process via student information systems, admission advisors frequently made errors when calculating credit grants. Despite revisions and adherence to standard operating procedures (SOPs), advisors continued to encounter errors, necessitating assistance from the student management system's support team.

Please refer to Appendix E: Table 4. Data Collection Table Per Project Question for a comprehensive overview of the questions posed during the project evaluation, the necessary data, the methods employed for data collection, and the relevant theories used for analysis. Data collection during the Preserve Step included the collection of three Ps: Paper, Participants, and Paradigms from the direct participants, as summarized in Appendix G Table 5. Data Planned and Collected Table.

An unexpected development occurred during the data collection process when a third-party company specializing in field expertise was engaged to assess GAMA's admissions processes. This change in the investigation arose from ongoing meetings and discussions organized between stakeholders, the partner organization, and the researcher, making the investigation dynamic in nature. While I presented ideas, asked questions, and collected insights, C-level executives from the participating sides also initiated changes. Such a scenario was helpful to my investigation, as it allowed triangulation of my findings and analysis. Insights from

interviews, focus groups, and meetings facilitated the gathering of qualitative information that validated the problem and identified its causes. My suspicions regarding potential issues in the admissions process stemmed from analyzing the report detailing the top errors. I incorporated insights from the evaluation report provided by the third-party company, which proved essential in confirming my observations.

Interviews with direct participants took place through various channels, both online and offline. The analysis utilized GEGI Event Logs to pinpoint primary error categories, confirming consistent recurrence when users followed similar steps. Participants were directed to examine these logs concerning categorized top tickets, organizing them based on frequency to identify underlying causes. However, a more comprehensive error examination was deemed necessary.

The investigation focused on systematized error reports rather than individual users or processes. Critical data included categorized tickets sorted by frequency and time spent on ticket resolution. One prevalent perception was that errors stemmed from training gaps and non-intuitive system logic, requiring further analysis for potential alternative solutions.

Summaries of interviews and focus groups conducted between experts from GEGI and GAMA were provided by the COO of GAMA, who used surveys to collect data during meetings. These meetings involved various departments and focused on finding reactive solutions rather than delving into root cause analysis. Thirty targeted meetings over the past twelve months were summarized, providing data for my analysis of the persistent error categories, urgency, impact, perceived causes, interdepartmental dependencies, timeline to resolve errors, and the value of error prevention/solution. These meetings involved various department representatives, including admissions, financial aid, accounting, marketing, IT, administration: specifically campus directors, and academics.

My analysis utilized GEGI Event Logs to pinpoint the primary error categories. These errors recurred consistently when users followed similar steps to achieve their objectives. Stored in the system's backend, these logs documented system activity, providing a sequential record of actions. Participants were directed to examine these logs concerning the categorized top tickets, organizing them based on frequency. This process confirmed and cross-referenced qualitative top errors, facilitating the identification of underlying causes, whether stemming from system malfunctions or user mistakes. However, a more comprehensive error examination remained necessary to delve deeper into the investigation. Notably, my project refrained from delving into an even deeper context of error analysis, such as whether errors persisted under the same conditions or varied across different environments. This examination of the error management process gave both companies insights into the root cause of the current problem.

Expanding from the initial identification phase, I proceeded to conceptualize my process analysis. Drawing from fundamental principles of process mining theory, I aimed to address the persistent challenge of consistent errors in operational processes faced by two companies. Key questions arise regarding the model of correct behavior: Is it normative? How do we discern the occurrence of errors? Are there standard operating documents within the institution that outline model behavior, and if so, are they static or dynamic? Furthermore, what is the level of detail provided in these documents regarding correct behavior?

I explored whether the issue pertains to the workflow of educational institutions or the usability of the system. Can model AI potentially alleviate resource strain for the academy by mitigating errors associated with data-intensive tasks? Subsequently, the next phase involved gathering information about the model behavior.

The educational operational process via the student management system is extensive and covers a wide range of departments working together. These operations are recorded in the database systems and can shed light on process efficiency. To discover this information there is a process called process mining.

The process mining techniques help discover, visualize, and analyze business processes using the backend platform data. This data can show deviations in execution from the modeled processes. Using such steps as conformance analysis, the administrator can compare extrapolated data: ideal behavior (actions of the users that are ideal for efficiency) vs. modeled behavior (actions specified in the manuals) vs. real-time behavior (what happens). I use a similar strategy in my problem conformance analysis.

Phase 2. Organize & Analyze. Analysis of the Problem Management

I collected documentation available to cross-reference how the phenomenon - the problem of persistent errors, was prevented. For this, I wanted to understand how both companies managed their processes. GAMA and GEGI used a few different databases to store their documentation that addressed user behavior: GAMA used Wiki pages to store internal policies and procedures that addressed "how to" questions per user role and task. GEGI utilized the Knowledge Base database to store its manuals, which were Standard Operating procedures that provided step-by-step guidelines to get to the desired output. Both organizations cross-referenced the tasks to ensure synchronized behavior. I analyzed the problem resolution patterns, the resources spent on resolving the problem, and the occurrence pattern of the repeated problem. The following paragraphs detail the processes used.

I identified the top errors using the analysis of the report from the GEGI Customer Support Team. The report outlined the top ten repeated categories of errors. I proceeded to the

next step: process mining report collection. I reviewed this qualitative report summary to identify the key information and compare it with the quantitative report summary I reviewed from GEGI Customer Service Reports platforms called Freshdesk and Redmine.

It is important to note that one of the problems when reviewing the reports was that the information was not systematized, and it took a long time to prepare a more systemic report, that would provide classified information. The problem was in settings. It appeared that none of the companies had ever initiated such data analysis. The settings of the requests were so vague and general that categorizing the data took months.

These circumstances and my questions during the review and categorization of the data triggered a change that occurred after my communication with the direct participants. The CEO of GEGI SIS, V. Golban, requested his team to provide me with a resource from his team (one person who would need to analyze, synchronize, and systematize two platforms and categorize them in the GEGI report). A copy of the part of the report can be found in Appendix H Table 7. Detailed GEGI Freshdesk Redmine Report. For this, I met with a GEGI expert representative weekly to perform the following work: Review the archive of the logs and cross-reference the data between the actions and the workflow.

After gaining visibility and fact-based insights into the recurring errors, I sought similar data from the manuals and policies of GAMA and GEGI. This information was accessible to all users on the GEGI website. The standard operating procedures were outlined in the Knowledge Base, providing step-by-step instructions for various actions. For each identified top error, I formulated model actions detailing the correct steps to act accurately. By identifying processes as they should be and deviations/errors that consistently occurred, I could visualize the pattern of

the processes associated with those top deviations. This information was helpful when creating a proof of concept for automation opportunities presented via new technologies such as model AI.

After collecting the meeting minutes, an analysis was conducted to pinpoint common areas of user perception, facilitating the identification of users' views on the causes of the errors. Subsequently, I scrutinized this process using the Fishbone Diagram, which should illustrate the analysis of the underlying causes contributing to the persistent error problem between the two companies. Preliminary discussions suggested that each company held the other responsible for shortcomings in certain areas, thus attributing them to the occurrence of errors. Based on the analysis, I organized the causes of the errors perceived by GAMA and GEGI users and employees. The summaries of the meeting minutes of the combined meetings and the interviews with the direct participants gave me information on the causes. The requests and top persistent error reports allowed me to triangulate the data.

Phase 3. Communicate & Track. Evaluation of the Findings

The third phase occurred concurrently with the second phase. Based on our agreement with the stakeholders and my partner organization, communication was ongoing, and the findings and recommendations were based on the final discussions and the final information retained.

Utilizing the data found during the first two phases, I constructed a logic tree to analyze the problem's existence, management, and possible solutions. Please refer to Appendix D Table 3. Data Collection Table per Phase. During the project's concluding phase, my focus shifted towards examining the potential value of the product for prospective clients, GAMA/GEGI. To achieve this, I explored potential alternative solutions, encompassing both human process enhancements and system logic modifications. I systematically discussed the analyzed

information derived from the collected data with the stakeholders and the partner organization and together we continuously reviewed the new finding. Discussions of the analysis and recommendations drove from more insight into the quantitative data of several key areas: such as cost benefit analysis of return on investment when comparing the possible solutions.

I used a mixed-methods approach, blending quantitative and qualitative methods to tackle the project's main questions. To ensure reliability, I gathered data through surveys, interviews, and expert reports from GEGI. Analyzing frequent error reports helped identify potential solutions for GoodRepsAI. I used an exploratory sequential design, starting by gathering qualitative data through reports, surveys, focus group discussions, and interviews. Afterward, I created a taxonomy for the quantitative aspect, allowing me to represent and understand the application's value numerically. Refer to Appendix F Figure 3. Exploratory Sequential Design Diagram for an illustrative flowchart depicting my project’s design.

In evaluating the further potential phases not included in this capstone work, it is important to remember that the data assessed here should help GoodRepsAI investigate the possible integration of Model AI into GEGI SIS. As such, it is important to consider further project questions: how accurately will Model AI handle everyday tasks within GEGI SIS? How do GAMA administrators perceive the integration? Is it user-friendly? Does it enhance their workflow or create additional friction? Will the Model AI handle the volume of requests and queries typical in GEGI SIS operations? How quickly will users adapt to using Model AI? Other important considerations will fall under the ethical component of the integration, such as ethical implications related to automated responses. Of course, there should also be an investigation into the Cost-Benefit Analysis in the review of the costs associated with implementing and

maintaining Model AI. My investigation did not include these questions, as they depended on the initial data discovery.

Data Security & Confidentiality

Due to the project's nature, no information related to names, roles, users, etc. must be disclosed. This is why the following is undertaken to secure the information's integrity and confidentiality. With the help of GAMA and GEGI, all reports that come to me in the form of the summary are depersonalized. This is done by identifying the Personally Identifiable Information (PII) is and either obfuscating, tokenizing, or removing. This concept is widely recognized across various industries that handle sensitive data. Many classifiers are employed to identify PII, ensuring compliance and data security standards are met (personal communication, Golban, November 2023). All the reports and data that I am / will be receiving come from the direct participants who create a summary report and send this summary report in the form of category title and numbers.

The information described in these reports is only related to the identification of the top persistent errors associated with task mining activity: title of the category of the error and hours spent. Most of the titles are reclassified to provide a general idea of the error type. The reports consist of anonymous data and no deeper information can be deduced from the reports besides the quantitative number of hours spent on errors and top classified errors that are persistent throughout the years of operations using the errors.

Part 4: Findings

In this section, I present the primary findings derived from the investigation conducted for the project. The findings are organized into two parts, corresponding to each project question. Within each section, I reiterate the project question and delve into the findings, providing clarity and detailed explanations. Additionally, I substantiate each finding with factual evidence to support the claims made.

Revisiting The Context

GoodRepsAI hesitated to invest further in research and development without expert validation. With proof of concept in hand, the investment into further R&D could potentially lead to GAMA piloting the ModelAI and becoming the first adopter of the tool. Such collaboration would secure the necessary funds for GoodRepsAI to further its diversification efforts. GAMA's CEO asserted that users consistently made errors, leading to revenue loss and administrative burdens. However, GEGI attributed these errors to GAMA's lack of internal expertise. My evaluation aimed to address the persistent errors in administrative processes, a subject of ongoing debate between GAMA and GEGI. By validating the existence of the phenomenon of consistent errors I could present necessary data for my partner organization to make decisions on diversification efforts.

GAMA and GEGI collaborated to enhance the efficiency of the enrollment process, but progress was limited. GAMA perceived the system as rigid, while GEGI believed that users required more internal development. Overall, there were complexities and challenges associated with resolving persistent errors in administrative processes within GAMA. The interview summaries and data found in report summaries, as well as the findings of the third-party evaluator described those persistent errors during enrollment processes, particularly by

Admission and Financial Aid Advisors, who claimed significant expenses and administrative turnover.

Despite various attempts to address these errors through cross-training and workshops, the overall error rate remained high. Users expressed frustration with the system's lack of intuitiveness, which distracted them from their primary responsibilities and led to burnout. Conversely, GEGI argued that the main issue lay with GAMA's lack of expertise. GoodRepsAI believed there was a solution to this problem, which could save both companies valuable resources.

The following sections covered three main findings, that were relevant to project questions and provided the basis of my recommendations. The three findings were: Proof of Concept: Admission Process; Cost/Value; SIS Logic.

Finding 1

Proof Of Concept: Admission process was found to be the top problem of consistent errors.

My first question focused on the validity of the claim. My findings were consistent with the claim that the recurrence of errors contributed to an ongoing problem and was a notable phenomenon observed in the operations between the two companies. The information that I had collected and analyzed based on two years of data showed consistency in the pattern of errors that both companies faced. The data indicated that the users of GEGI requested help with the same types of errors, with the top category identified as Admissions Processes.

GAMA was grappling with increased operational complexity by incorporating third-party platforms like the GEGI SIS and other similar platforms. These platforms interacted with others to address various institutional needs. For instance, during an interview with COO B. Malin, GAMA discussed collaborating with Lead Squared (LSQ) to enhance lead generation quality and

quantity. Before LSQ, GEGI SIS managed lead registration, primarily from website inquiry forms or manual entry by front desk representatives. However, the CRM provided by GEGI SIS lacked detail, requiring the admissions team to organize leads using separate Excel sheets and shared documents. Requests for additional features were hindered by resource constraints and development time. GAMA then opted to integrate the third-party CRM LSQ, leading to the challenge of two separate systems handling the same profiles. This resulted in manual double entry issues being resolved but introduced new technical problems like incorrect synchronization and duplicate entries. Despite changes, errors persisted, aligning with Mukerjee's observations on automation in organizations.

There was a perception that using a third-party system significantly reduced the number of staff required for support and maintenance of the systems. In reality, this may not have been the case as using third-party software in no way negated the need for in-house business analysts, quality assurance analysts, database administrators, programming staff (for internal customizations), and support staff (Mukerjee, p. 53, 2012). Information received from the third-party evaluator, Freshdesk reports, and GAMA Perception Summaries supported my findings and validated the data. For more detailed information on the findings, please see below.

Third-Party Evaluator "PowerSolutions"

The third-party evaluator provided a report of findings with opportunities and strengths. For this project, I concentrated on the opportunities described in the report. They confirmed my findings from the Perceptions of Users from GAMA and the GEGI Freshdesk Report.

GAMA's reliance on GEGI to create enrollment agreements created a process that undermined administrative efficiency, as it needed consistent changes that created exceptions and requests from the GEGI Support team to help undo or update data before finalizing the

enrollment. Per the Assessment Report, the current system process and workflows resulted in an unnecessary administrative burden for GAMA. GAMA should undertake a project to automate the admission and financial aid processes. “It is imperative for the system to be flexible and designed to account for these scenarios and help minimize the need for manual intervention” (Compliance Assessment Report, 2024).

Perceptions of Users in GAMA

When reviewed on a granular level, the enrollment process that involves multiple users and dependencies creates the top category of errors. Here is an example of the real-time enrollment processes of students at GAMA using GEGI SIS based on the discussion and review of the processes with the GAMA COO (B. Malin, Interview, December 15, 2023).

Admission Advisors (AA) and Financial Aid Advisors (FAA) use the SIS to perform an enrollment process. The system is student-centered, and students are not self-enrolling. This means enrollment is driven by the actions the AAs and FAAs perform. The actions are also co-dependent, meaning that the information entered is synchronized, and if there is an error during AA’s actions, the FAA will not be able to do anything until the error is fixed. This creates a bottleneck; if the enrollment is not finalized and the FAA is not completed, the student cannot attend the designated course.

If an AA makes an error in the enrollment agreement during the enrollment process, they don’t know what to do to cancel the incorrect action; the system shows an error, and the AA requests help from the support team. Now the support team reviews the request and asks the AA to help identify the reasons for the error and how to fix it. The AA then fixes the error. The FAA starts their work. Similarly, there is a problem with the financial portion of the enrollment process, which requires the FAA to request another ticket. The time it takes for the support to

review the requests, evaluate the situation and the error, find the correct action, and get back to the AA/FAA can take a few days, weeks, and sometimes more.

By learning and modeling the behavior of the users, the model can learn the patterns that lead to the error and the correct behavior and guide the users in real-time by providing prompts on how to achieve the desired outcome. This model will help prevent bottlenecks and serve as a training tool for users. The ability to revoke the errors that persist in operations in real-time will help administrators streamline their processes.

To emphasize, numerous requests originate from system limitations hindering further advancement, prompting users to reach out to the GEGI Support Team for clarification and assistance. While error messages attempt to explain issues, many users struggle to independently resolve errors, necessitating support from the GEGI team.

In 1991, Frese introduced error management as a strategy to cope with errors, minimize negative impacts, and optimize positive outcomes such as learning and innovation (Freese, 1991, p. 665). The "undo" command on computers serves as a practical example of error management, enabling users to reverse mistakes effortlessly (p. 666).

Applied to the persistent errors observed in this case, it's evident that there isn't a straightforward "undo" option due to existing processes, requiring collaborative efforts to identify necessary changes and guide users toward the correct actions. Reviewing meeting minutes between company representatives revealed the implementation of various error management measures, as perceived by users involved in the admissions process.

Surveys, Meeting Minutes, Emails, and Interviews Summary

The top category of errors was related to the Admissions Process. The Directors of Admission and Financial Aid Departments agreed in their identification of the top error -

finalizing Enrollment Agreements, “populating the students,” i.e., finalizing the enrollment of a student. On a granular level, the top enrollment problem is in a category: re-enrollment problem.

One of the questions that was also asked by the participants was: To what degree did the challenges with the technology contribute to the turnover for the past 2 years?

Based on the summarized findings from all meetings, discussions, focus groups, and surveys, the provided table presents the perceived data per Admission Representative at GAMA. For detailed information, please refer to Table 6. Perception of GAMA Users.

Table 6. Perception of GAMA Users.

Visual of the Data as Perceived by GAMA

# of Admission Representatives	25
Average % of time spent/request daily per AR	20%
Average # of enrolled students per year per AR	100
Average # of hours spent per request daily.	1-2 hours
Number of students on average could be enrolled per AR per year.	.8
Top Category	Admissions

In general, the Admission Process encompasses both Admission Advisors (AAs) and Financial Aid Advisors (FAAs). These roles have been consolidated into Admission Representatives (ARs) due to the equal division of responsibilities between AAs and FAAs in the admission process. The Representative category encompasses the directors of both departments, as they devote equivalent time to troubleshooting requests.

The surveys, meetings, and focus groups conducted involved discussions and inquiries regarding the perceptions of how much time Admission Representatives spend on troubleshooting similar errors in the admission process.

The data collected includes the frequency and duration of time spent per request daily (expressed as a percentage of time and number of hours) on troubleshooting enrollment problems (recurring errors). Additionally, other columns in the dataset include the average number of students enrolled per year.

GEGI Report from Freshdesk and Redmine

The primary challenge I encountered during the data collection and analysis of the top requests stemmed from the difficulty of cross-reference the data. A crucial component of the data I required is based on tagging. Typically, each bug report, customer interaction, and feature request present an opportunity to identify issues and requirements that might otherwise go unnoticed or unheard.

GEGI SIS uses two software systems for their request management. GEGI also has two dedicated divisions of support users: engineering and customer support. The systems they use to manage the requests are Freshdesk and Redmine. GEGI SIS has GAMA users reaching out daily. Sifting through the influx of emails, calls, messages, and reports proves to be inefficient, overwhelming, and costly for the entire team. However, GEGI SIS did not utilize the tools necessary to help automate the data retrieval. Freshdesk and Redmine offer organizational tools like tags to streamline the workload of the Support team. Tags are words or phrases utilized to identify or provide additional information about errors. In customer support, tags are used to organize, manage, and contextualize customer interactions.

My quest to triangulate the qualitative data from GAMA users and Support Team with the quantitative data from the software systems came to the following barriers:

- The Freshdesk system was not tagging the requests/tickets on a granular level. For example, when asked to provide the report of the top tickets, the direct

participants had a difficult time providing answers. It turned out there was no analysis done to identify such parameters because there were no settings correctly established to categorize the requests.

- The Redmine system was not able to identify the numbers needed, because it only retrieved about 1% of all requests from Freshdesk. These requests were not fixed with the support system and users and needed intervention from the engineering team.

The report from GEGI's support services revealed that the top error category over the past two years pertained to Admission Process errors, specifically dealing with the finalization of student enrollment into the program. The Freshdesk Report offers data on the interactions between Gurnick personnel/students and GEGI Customer Support. This dataset was compiled from all the FreshDesk (email user requests) tickets for the period spanning January 1, 2022, to December 31, 2023. Prior to analysis, the dataset underwent cleaning procedures, which involved excluding null values and automatic notifications. The final report comprises 7517 tickets. For detailed information, please refer to Appendix H Table 7. Detailed GEGI Freshdesk Redmine Report.

This data has either been taken directly from the source or calculated for each ticket separately. You can use filters ("Data" Tab - "Filters") to look for information or trends in this sheet (e.g., sort tickets by Time Passed to find the exact tickets which took the longest to resolve, see screenshot). The report is dynamic, and the second sheet "Indicators" provides processed results derived from the information in the first sheet. The key feature for this report is that it can adapt for one's needs: changing or adding the keyword will automatically calculate the indicators

accordingly. An important way to look for trends in the data is to use “Sort & Filter” functionality.

The second row indicates the total Admission Process requests. Admission Errors are 34,67% of all tickets, this means that 2,606 requests are Admission process related out of 7516 of all requests for the past two years. The hours spent per request totaled 257,23 hours on average. In other words, on average it takes 10 days to close the request that deals with an admission process. This validates the bottleneck discussed by the Admissions Representatives. Refer to Appendix I Figure 4. Persistent Error Phenomenon Summary GEGI Report. It provides a summary of the information from Freshdesk and Redmine to look at the data from quantitative reports of requests.

Finding 2

The current problem is costly to GAMA / GEGI, and the cost of the solution is high for GoodRepsAI.

Recall that per my conceptual framework, based on PROACT by Latino (2020) Phase 3 of my evaluation is called Communicate and Track. This phase includes continuous communications during the analysis of the findings. While meeting with the direct participants and discussing the findings, together with the stakeholders, we calculated the cost of the problem, or I refer to it as the solution's value. Based on the conversation the following was calculated as the cost of the problem based on the data provided by my first finding. Let us review each statement in detail.

Cost of the Problem for GAMA/GEGI

There were two assumptions about the cost of the problem: High Turn Over Rate & Low Enrollment Rate, as well as the resulting increase in Support Services and Low Student Enrollment Rate. Let's examine each assumptions.

- High Turnover Rate, GAMA

In his interview with me on December 20, 2023, Malin indicated a significant turnover rate among Admission and Financial Aid advisors over the past two years. He suggested that this turnover might be attributed to ongoing troubleshooting and inefficiencies in the processes involving GEGI during admissions. Malin stated, "It is likely due to the troubleshooting and consistent inefficiency of the processes with GEGI during the Admissions process. I heard they got tired of it" (interview, 12.20.23). However, I could not verify this claim as no data was provided to me linking turnover to specific reasons. Interviews and surveys with department directors suggested an unfamiliar perspective, denying the assumption of turnover being solely due to GEGI-related issues. Nevertheless, it was notable that the Academy had increased hiring to support the admissions processes.

The problem does not solely revolve around turnover rates; rather, it's the additional resources allocated for hiring extra Admission Representatives per campus. The Academy estimated hiring six additional Admission Reps and two Assistants for the Admissions and Financial Aid Directors to alleviate the workload.

- Low Student Enrollment Rate, GAMA

When examining enrollment figures over the past two years, GAMA has consistently observed a decline in enrollment rates. According to data collected from Admission Representatives (AR) and presented to Malin during a meeting in January 2024, a sizable portion of the issue stems

from ARs spending approximately 25% of their time troubleshooting errors. This translates to approximately 2 hours of work per day per AR. In terms of lost opportunity cost, Malin estimated that this time equates to 10 students per year per AR. Further calculations conducted during our discussion surrounding this discovery indicated that "given that there are 25 ARs, the estimated number of potentially signed contracts lost is around $10 million or $3.5 million in revenue annually" (Malin, 2024).

- Support Time and Client Rep, GEGI

During the same meeting (February 2024) with the stakeholders, Golban, the CEO of GEGI, also provided his assessments regarding the costs associated with the issue. He highlighted that there is a significant risk beyond just the potential loss of income for the GEGI team. Despite this time being billable as a professional service, the team's focus is diverted from essential feature releases for new clients. Instead, GEGI engineers find themselves dedicating their time to understanding and explaining errors to the support team, who then collaborate with GAMA team members to address the errors. The engineers' time is crucial as it is when they can address "bugs" and work on new features. However, this diversion delays the delivery of fixes and new features beyond the promised timeline, posing a risk of losing clients. Golban emphasized that this situation imposes an unreasonable burden on GAMA and undermines GEGI's ability to remain competitive in the market.

The GEGI report provides insights covering the period from January 1, 2022, to December 31, 2023. Analysis of support activities in both Redmine and Freshdesk reveals that the majority of tickets are resolved internally without developer involvement, comprising approximately 97.43% of the total. This underscores the proactive handling of daily tasks by our team within the realm of support duties. Notably, admissions encounter a significant loss in time

and costs per ticket or volume. To address this issue, a potential solution involves revising the approach to acquainting admissions with GEGI's logic. For visual representation, please refer to Appendix J Table 8: Detailed GEGI Freshdesk Redmine Report on GEGI Support Time.

Cost of the Solution for GoodRepsAI

Based on my meeting with the CEO of GoodRepsAI (2.2024), the ModelAI can be a solution, however there are factors that need to be accounted: The Algorithm and The ModelAI training. Additionally, due to my Finding 3 (see below), there is a system logic error that needs to be fixed first before the model can be trained properly.

Finding 3

SIS LOGIC has a flaw.

This finding, in line with the Third-Party Assessment Report from GAMA and the consultation with the CTO of GEGI SIS, affirmed that the logic of the GEGI student information system was built upon an ideal model of the student admission process. Please recall the Problem Validation Phase, particularly during the Preserve step, when I dedicated efforts to validate the hypothesis that the GoodRepsAI tool could potentially mitigate the issue of persistent errors. My objective was to verify the existence of a consistent problem marked by recurring errors. As a result of the investigation, one of the identified causes of these errors was attributed to the flaw in the logic guiding the business process strategies within the system.

In the ideal student scenario, ARs facilitate the enrollment process smoothly for new enrollees, who lack prior credit grants or course history. This scenario epitomizes the optimized flow or "golden path" within the system's primary process. By "golden path" I mean an optimal sequence of actions within the student admission process, characterized by minimal complications or deviations from the standard procedure. However, the outcome of my

assessment (referencing the Fishbone diagram) combined with the third-party evaluator's findings revealed that GAMA's admission process for the "ideal" student deviates from this ideal model.

It's important to clarify the meaning of an "ideal" student in this context. From GAMA's perspective, the ideal student profile represents the most common scenario. Essentially, it refers to the typical cases encountered. However, the system interpreted that the ideal flow of the process is based on the simplest case, with the assumption that the simplest cases are the most common. Conversely, exceptions to this ideal scenario include re-enrolled students, those with credit granting, or those returning from a leave of absence.

I triangulated the above data by cross-referencing the detailed reports from GEGI Freshdesk and Redmine. Indeed, most errors stemmed from manual recalculations required by representatives, as the system flagged them as exceptions. In layman’s terms, almost every case that was not a simple enrollment, was flagged as executionary – thus triggering more work for the admissions representative, forcing the admission and financial aid advisors to calculate the exceptions manually. This contributed to a rise in human error and permissions allowed for AAs and FAAs to forgo the error population.

Part 5: Recommendation

Part 5 of this paper highlights the final recommendation based on the continuous conversations held with important stakeholders and the investigation of possible solutions for the issues identified. It also explains the reasoning behind the suggested approach and its implications for future steps. It's important to mention that many of the recommendations offered during our meetings were put into action, propelling the project forward. The recommendation outlined here is the ultimate one, that synthesizes the previous conversations and plans addressing the project's main question.

Final Recommendation

During our last meeting in March 2024, my ultimate recommendation to GoodRepsAI emphasized an integrative approach. Informed by stakeholder decisions, logic tree outcomes, and a literature review on innovation value, early adoption, and third-party servicing, implementing third-party prompts generated by a trained Model AI could offer potential value to GAMA and GEGI.

I recommended that GoodRepsAI invest in research and development of a new algorithm for the ModelAI tool, positioning themselves as the first AI third-party servicer in GEGI SIS, catering to the needs of GAMA. Scaling up an intervention could reshape business models. Therefore, I proposed starting with a small experiment where the research and development of a new ModelAI would train the model to understand logic and prompt users in correct actions, following well-written standard operational procedures.

It was important to do this then, as GAMA and GEGI were undergoing a significant evaluation of the system logic, driven by a third-party external expert. This presented an essential opportunity to learn logic and ideal behavior, understanding if the phenomenon persisted after

the logic was fixed. According to Gafurov et al. (2020), investing in innovation was crucial for educational institutions to remain competitive in today's digital era. As digitalization progressed, technological challenges in administrative processes emerged, necessitating innovation investment.

Integrating innovations like AI into educational processes offered significant value (Gafurov et al., 2020). However, it required expertise to manage systems effectively. Training the Model AI to learn ideal model behavior and provide user guidance offered scalable value. Universities had to enhance responsiveness to internal and external changes, particularly in the digital era, to remain competitive.

GoodRepsAI had to weigh concerns and benefits before investing in research and development. Uncertainties existed regarding the persistence of problems post-logic fix and the ModelAI's ability to solve them. Financial risks were associated with investment, but effective control and support systems were necessary for improved performance and organizational image (Gafarov et al., 2020).

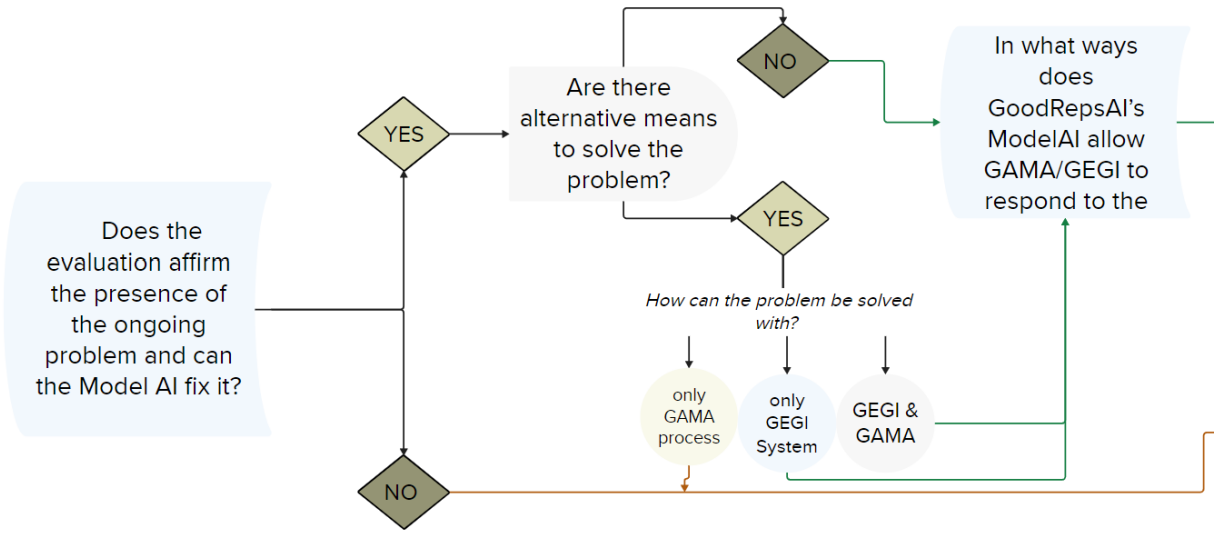
I recommended starting with one engineer allocated to logic review, new logic implementation, ModelAI training, and algorithmic re-write. The research and development of the new ModelAI might take longer than fixing the problem, necessitating careful risk-benefit analysis based on GoodRepsAI's resources and capabilities.

Third-party servicing offered benefits like expertise, efficiency, scalability, and cost-effectiveness for educational institutions (Holland & Knight, 2023). It enhanced efficiency and expertise in managing educational processes but required considerations to ensure security and mitigate risks. In accordance with the conceptual framework guided by PROACT® Root Cause Analysis (Latino et al., 2020), the final phase of my investigation was Phase 3, Communicate &

Track. This phase involved ongoing discussions with direct participants representing my Partner Organization and Stakeholders (see Table 3 for the Data Collection Table per Phase). During this concluding phase, my focus shifted towards examining the potential value of the product for prospective clients, GAMA/GEGI, driven by my second question.

I explored potential alternative solutions for GAMA/GEGI to address their concerns, systematically discussing findings with stakeholders and the partner organization. Due to the sequential design of my evaluation, the logic tree was dynamic. This meant that based on the findings and answers of the first question, I altered the logic tree to reflect the findings and modify, if necessary, the following questions of my evaluation. Please refer to Figure 7. Logic Tree Diagram Part A below. The diagram showed my original design of the possible routes that would lead me to answer my primary question: Did the evaluation affirm the presence of the ongoing problem and could ModelAI fix it?

Figure 7. Logic Tree Diagram Part A



- If one or both answers result in a NO, the evaluation concludes with: Do not recommend the ModelAI as a solution currently. For full Logic Tree Diagram, please refer to Appendix K Figure 5. Logic Tree in Phases 1&2.
- If one or both answers are YES, the evaluation continues to assess sub-questions:
    - Are there alternative means to solve the problem?
        - NO – leads to further investigation of the second main question of the project: In what ways, if at all, does GoodRepsAI tool provide value to GAMA/GEGI?
        - Yes – leads to understanding how the problem may be solved in alternative ways. There are three ways to solve it:
            - GAMA user/human processes only: If the root cause of the problem lies solely in human processes, focus should be on enhancing user processes through reviewing procedures, training materials, and SOPs, and conducting workshops.
            - GEGI SIS only: If the issue solely stems from the system's logic or technical hurdles, it necessitates a thorough investigation into resolving these challenges, considering whether ModelAI can assist GEGI SIS or if GEGI SIS should reconsider its system logic.
            - The combination of both: When both user and system factors contribute to the issues, a similar investigative approach is necessary, assessing the extent of each cause and identifying solutions leveraging resources within the system and the academy.

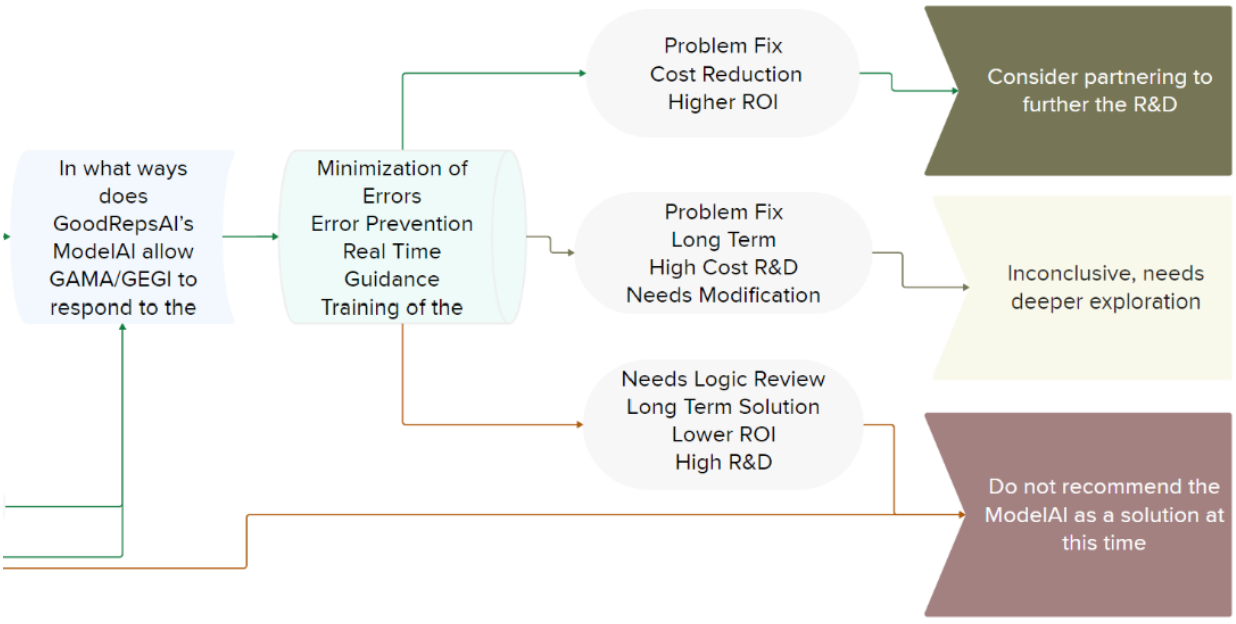
As I moved onto the second primary question of the project, recall from Question 2, which focuses on exploring the potential value of the GoodRepsAI tool for GAMA/GEGI, I planned to

assess the value of the tool for GAMA and GEGI by comparing the costs of the current resources as alternative solutions at the disposal of both the academy and the system with those of ModelAI.

- If initial assessments suggest that the solution relies solely on the proposed ModelAI, I will delve into consideration of ROI, such as implementation timelines and financial returns. This value proposition analysis will inform the next phase, should the company choose to proceed with the recommendation.
- If assessments suggest that the solution relies on alternative measures as well as ModelAI, I will conduct a thorough examination of the cost-benefit analysis and conduct a comparative assessment between the alternative solutions and ModelAI.

The logical flow can be traced by referring to Figure 8. Logic Tree Diagram Part B below.

Figure 8. Logic Tree Diagram Part B



If my evaluation suggests that the implementation of the ModelAI leads to a lower ROI than the alternative solutions, further investigation will be necessary to create a scope for comparative analysis. At this juncture, my recommendation will advocate no partnership.

As the evaluation process advanced and new findings informed subsequent questions, the logic tree underwent modifications. As illustrated in Figure 7. Logic Tree Diagram Part A, the primary question encompasses two project questions, both of which necessitate affirmative responses to guide the sequence:

- Does my evaluation affirm the presence of the ongoing problem?
- Can the ModelAI fix it?

Drawing from Finding 1, POC – Admission Process, the answer to the first question is affirmative. The findings verified the existence of a recurring error phenomenon. While during the initial meeting with Prokhorenko (2024), the second question received a positive response, further analysis through a cost/benefit assessment is required. Consequently, the logic tree progressed to the subsequent phase of evaluation. During the exploration of alternative solutions to compare against GoodRepsAI, a second finding emerged. It became apparent that alternative means exist to address the problem, emphasizing the necessity to comprehend the problem's cost/value and compare it with GoodRepsAI.

Please refer to Appendix L Figure 6. Logic Tree in Phase 3. for visualized details. As shown, the logic tree has been altered due to the latest findings. The logic tree outcome is triangulated with my and third-party evaluator findings as discussed in Findings section. Findings 2 & 3 indicate a flaw in the system logic that must be rectified for GoodRepsAI to effectively train their ModelAI.

During our second meeting with direct participants, Malin (February 2024) conveyed that "Comparative analysis suggests that it is more effective for GAMA/GEGI to employ a third-party expert to solve the logic problem." He further explained, "If we were to contract with GoodRepsAI, there will be a need for them to hire an expert that understands the logic flaw, and their ModelAI is not trained to fix errors of such nature." Not only will the AI solution need domain expertise, but it will require proper instrumentation to calibrate and analyze. Despite attempts by GEGI and GAMA to implement remedies, persistent issues remain unresolved.

Conclusion

The logic tree analysis conducted in accordance with the PROACT® Root Cause Analysis framework (Latino et al., 2020) culminated in Phase 3, Communicate & Track, where ongoing discussions were held with direct participants representing the Partner Organization and Stakeholders. During this phase, the focus shifted towards evaluating the potential value of the product for prospective clients, GAMA/GEGI, driven by the second question. Exploring alternative solutions for GAMA/GEGI and systematically discussing findings with stakeholders and the partner organization led to a dynamic logic tree.

Moving on to the second primary question, an integrative approach is recommended based on the logic tree outcomes, stakeholder decisions, and a literature review on innovation value, early adoption, and third-party servicing. This approach entails investing in research and development of a new algorithm for the ModelAI tool, positioning GoodRepsAI as the first AI third-party servicer in GEGI SIS, catering to the needs of GAMA.

I hope that it is clear from the paper that this project is an initial step crucial for gathering comprehensive data on the problem and potential solutions using ModelAI. This technology is emerging and is being developed and applied to different areas and applications. As a result, the outcomes of this capstone and the data are still very much evolving as ML and AI evolves. However, several key aspects need further attention:

- The project currently lacks a robust technical foundation. To conduct a thorough review of ModelAI's capabilities, it is essential to establish a solid groundwork using the engineering experts together with the experts from the system and the Academy. This includes understanding the underlying algorithms, assessing resource requirements, and

evaluating the feasibility of implementing the proposed solutions. The existing algorithm may need (re)writing or optimization. A deeper dive into the algorithm's intricacies will help identify areas for improvement. This step is critical to ensure that ModelAI performs optimally and aligns with the project's goals.

- Reviewing the company's business model concerning the specific applicability of ModelAI is crucial. Understanding how the technology fits within the organization's overall strategy and revenue model is essential for successful implementation. GoodRepsAI should actively engage with academy-level processes and system workflows. This involves collaborating with stakeholders, understanding institutional needs, and ensuring that the proposed solutions align with educational management objectives.

While the initial exploration sheds light on ModelAI's basic functionalities, a deeper technological investigation is necessary. GoodRepsAI's commitment to thoroughness will pave the way for effective problem-solving, model implementation, and system enhancement. Considering the ongoing evaluation of the system logic by GAMA and GEGI, now presents an opportune time to invest in innovation. However, uncertainties exist regarding the persistence of problems post-logic fix and the ModelAI's ability to solve them. Therefore, careful risk-benefit analysis is warranted, along with considerations of third-party servicing benefits and potential risks.

In conclusion, starting with one engineer allocated to logic review, new logic implementation, ModelAI training, and algorithmic rewrite is recommended. This approach, along with considerations of third-party servicing benefits and risks, could potentially reshape business models and offer scalable value to educational institutions.

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Appendices

Appendix A Table 1. Third Party Servicer

Summary of the Benefits & Challenges with TPS

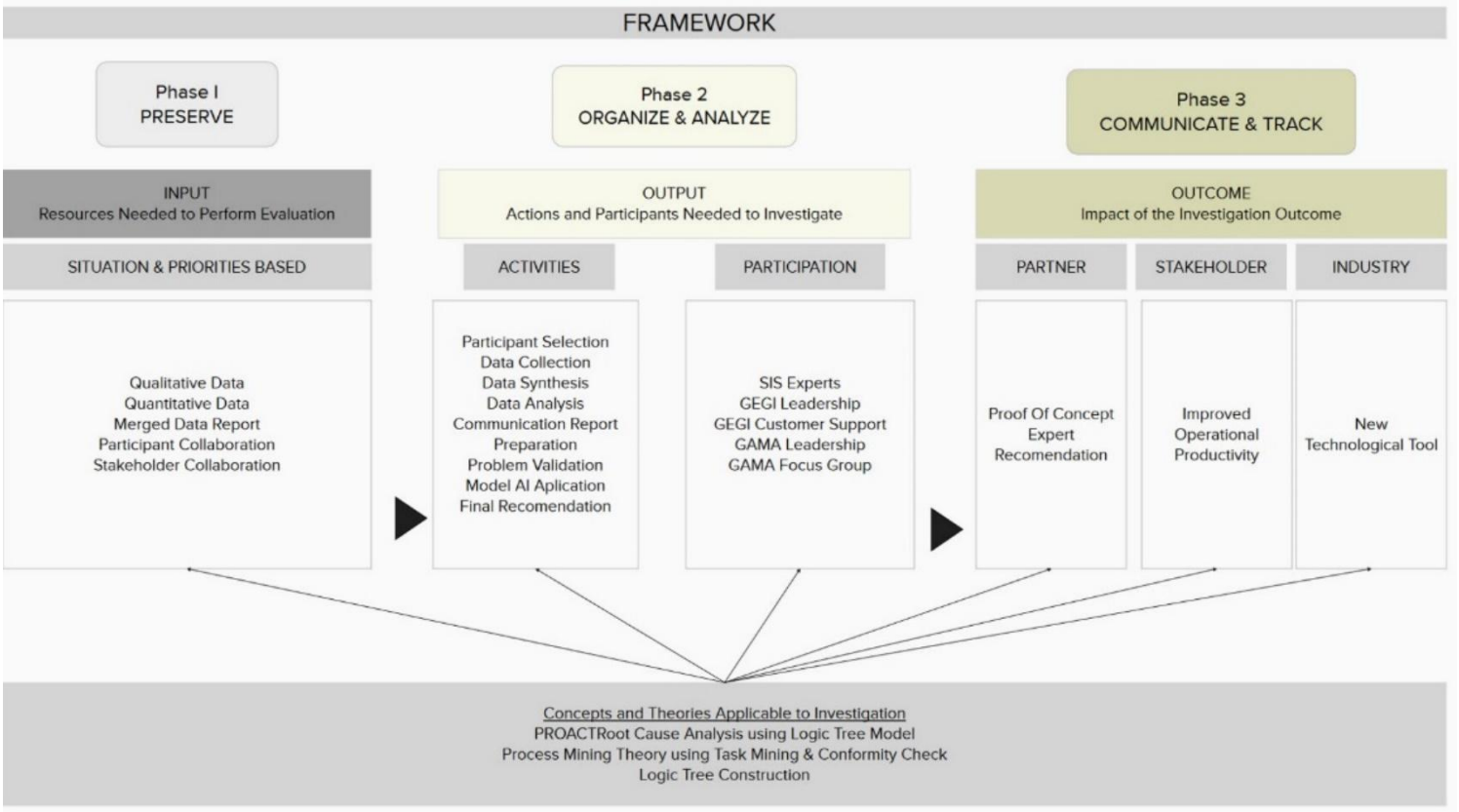
Benefits		**Challenges**	
Expertise	Specialized expertise in FA, Admissions, Compliance, Technology	Data Security	Security and confidentiality of student records when shared with other parties
Efficiency	Outsourcing to allow institutions to focus on core activities	Contracts	Clarity of contracts to define roles, responsibilities and expectations
Scalability	Ability to handle a large-scale data processing and managerial tasks effectively	Transparency	Need to maintain transparency for students and staff to avoid confusion
Cost-Effectiveness	Can become part of savings in comparison to in-house resource utilization	Risk Mitigation	Need for strategies on risk mitigation.
Compliance	Help for institutions to stay in compliance with regulations and reporting	Oversight	Regular monitoring to ensure adherence to agreed – upon standards

Note: The US Department of Education's guidance emphasizes the benefits and challenges

(Holland & Knight, 2023).

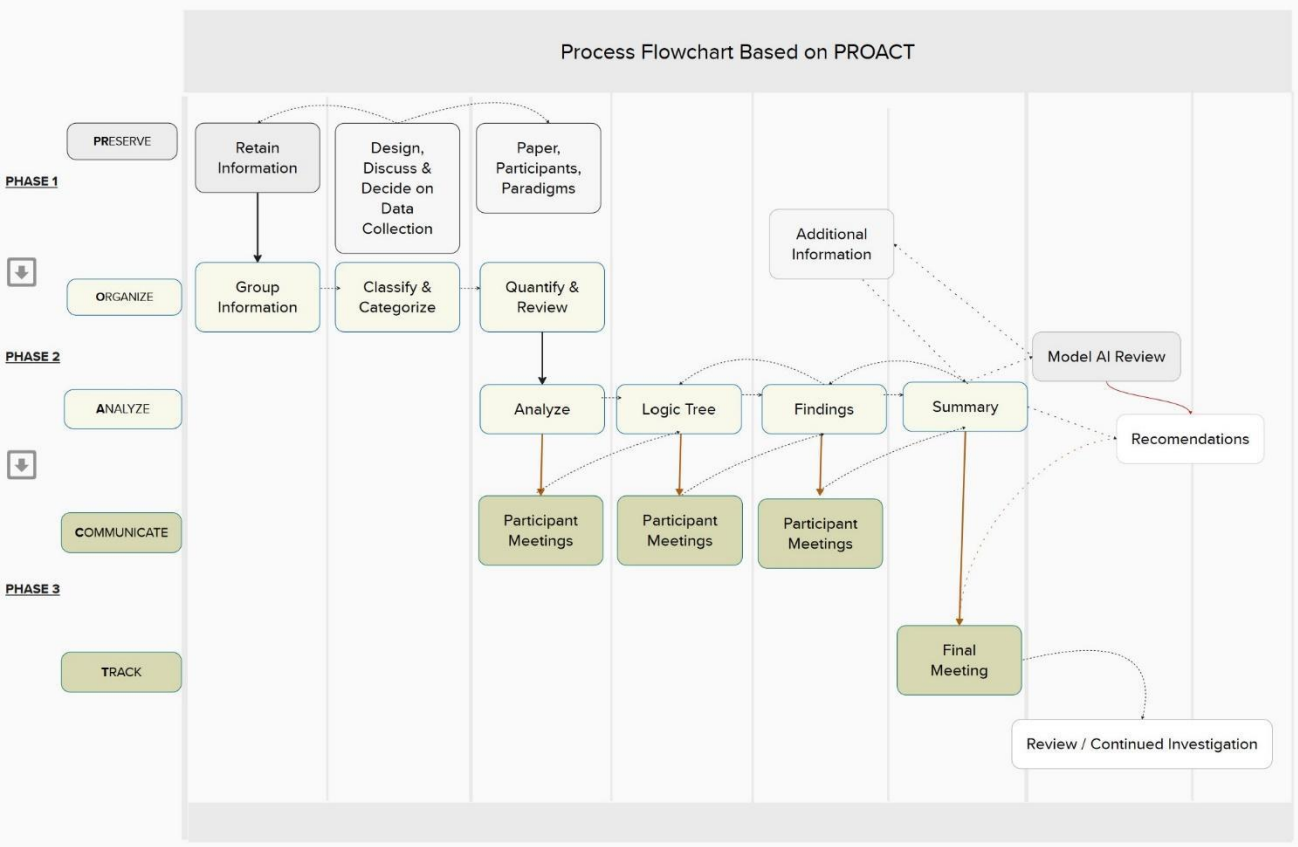
Appendix B Figure 1. Conceptual Framework

Conceptual Framework Diagram



Appendix C Figure 2. Process Flowchart

Process Flowchart Diagram



Appendix D Table 3. Data Collection Table per Phase

Summary of the Data Collection, Analysis and Organization

	PHASE 1 **Problem Validity**	PHASE 2 **Problem Analysis**	PHASE 3 **Findings Evaluation**
Data Collection	Summary Report of Focus Groups, Interviews, Surveys	Triangulation of data cross referencing perceptions, qualitative and quantitative data	Report of triangulated model and identification of the top errors, cost of the problem / value of the solution
Data Analysis	Process Narrowing per behavior, collection of the problem areas, i.e. persistent error categories	Analyzing problem resolution patterns, resources spent, frequency of occurrence, patterns in persistence of requests.	Logic Tree for visual aid to progress to recommendations and through sequential elimination of questions per finding
Data Organization	Collecting and analyzing data for proof-of-concept delivery	Analyzing the organizable data, Relating the data to problem management of the organization.	Evaluating Findings, Developing further plan of action in collaboration with the stakeholders

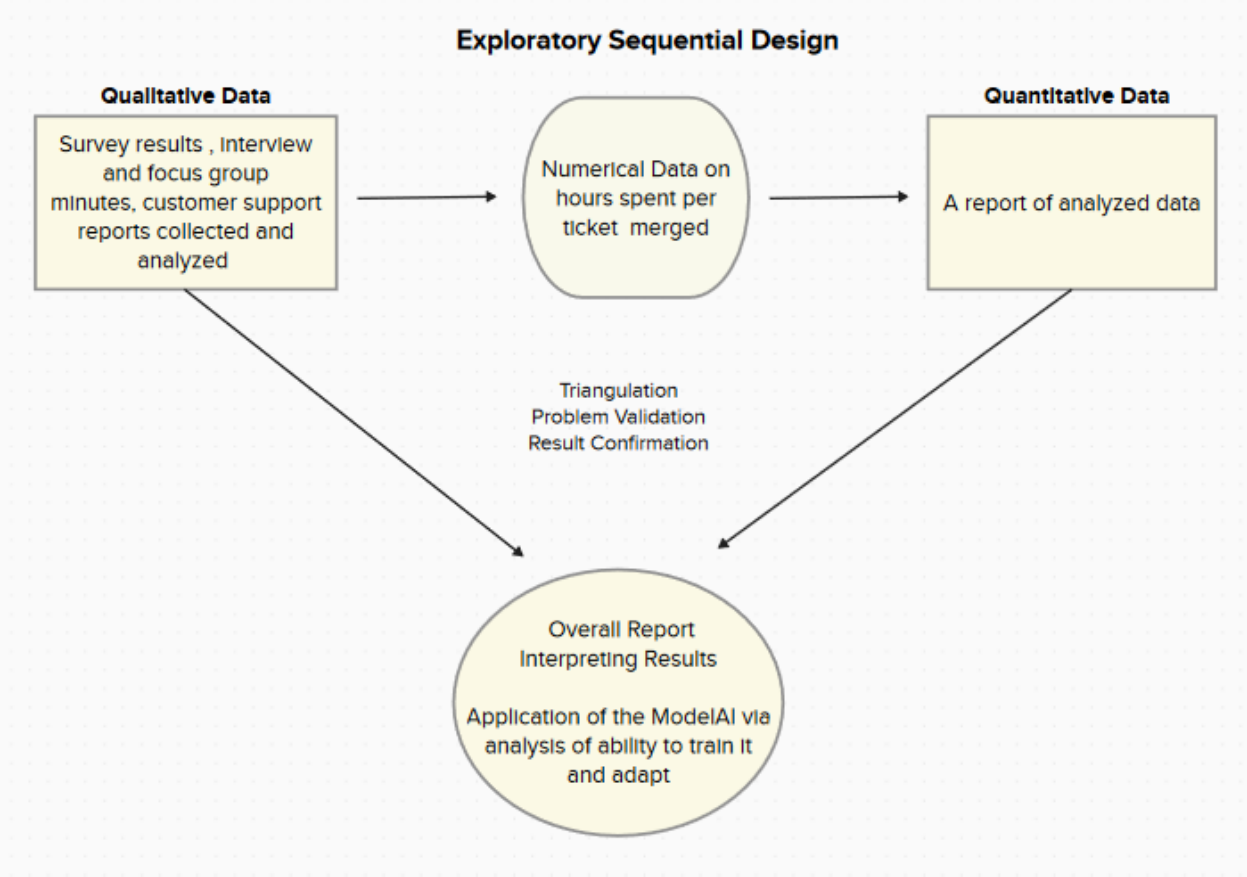
Appendix E Table 4. Data Collection Table per Project Question

Data Collection, Methods, Analysis and Theory per Project Question

Q1	Q2
Does the evaluation affirm the presence of the phenomenon of an ongoing problem?	In what ways does GoodRepsAI's ModelAI allow GAMA/GEGI to respond to the problem identified?
DATA	
Top Errors Report Hours Spent per Error Perception of Root Cause of Problem	Alternative Solutions GAMA description of processes ModelAI Algorithm GEGI logic review
COLLECTION METHOD	
Freshdesk /Redmine Report Interview Summary Summary of Meeting Minutes	Gama workflows (manuals, etc) GEGI Knowledgebase Discussions (interviews, meetings, emails)
ANALYSIS	
Validating the problem by confirming the identified issue is factually significant and warrants investment in resources, effort, and potential scalability.	Working to unveil the root cause of the problem by identifying and highlighting the underlying relationship issues crucial for data – driven decision making. This process includes constructing a visual representation of the interconnected concepts.
THEORY	
Error management Process mining. Deconstruction of jobs Robotic process automation	Root – Cause Analysis PROACT Logic Tree Error Management

Appendix F Figure 3. Exploratory Sequential Design Diagram

Visual of the Data Collection, Triangulation and Validity.



Appendix G Table 5. Data Planned and Collected Table

Visual of the Data Planned and Collected with Methods of Collection

Data Planned & Collected	**Method**
Top Persistent Errors per Category of Error & Hours Spent per Error/Ticket/Request	GEGI Freshdesk Report GAMA/GEGI Report Consolidated
Top Persistent Errors Perceptions & Hours Spent Per Error/Concern	GAMA Interviews Focus Groups, Summary
GEGI Workflows	GEGI Knowledgebase, Redmine
GAMA SOP	GAMA Online Access

Appendix H Table 7. Detailed GEGI Freshdesk Redmine Report.

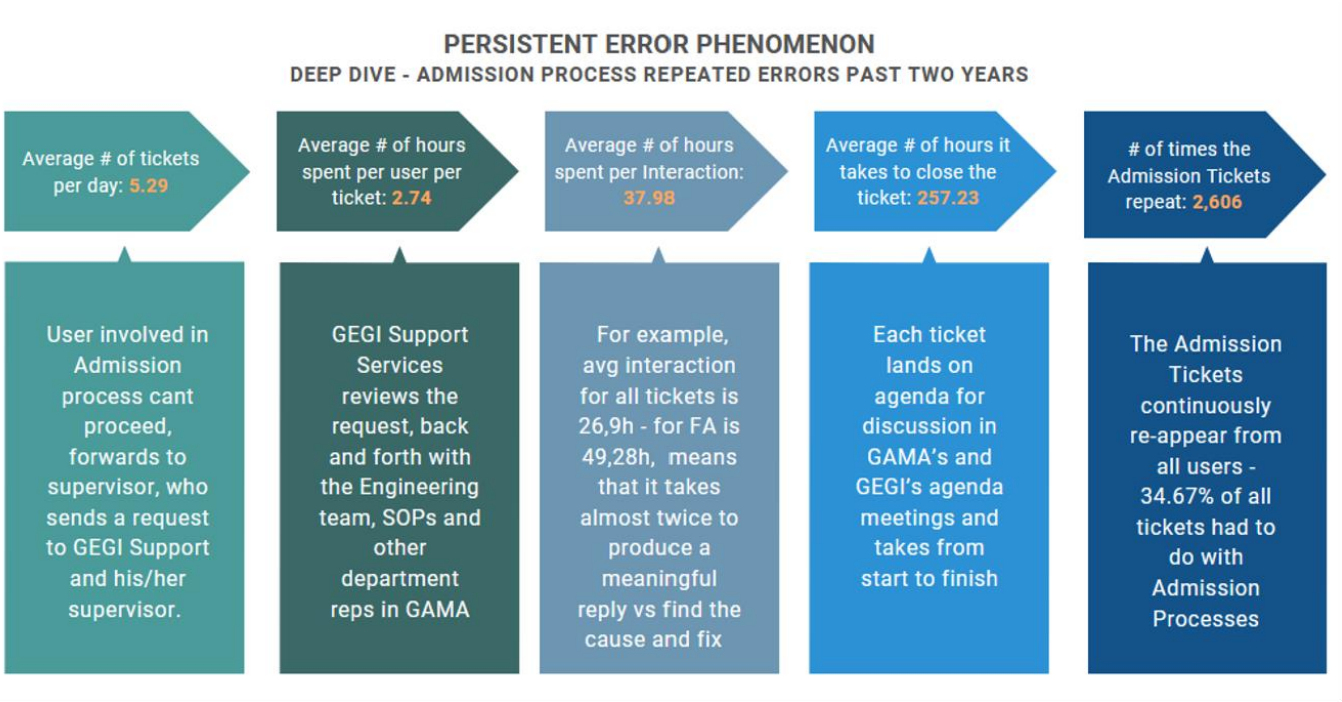
Granular Data of Admission Process Repeated Errors

Keywords	# of requests per day	Average GAMA Interactions	Average Interaction time	HS per request	Number of Tickets	% of all tickets
All Tickets	15,28	2,18	26,9 h	159,54 h	7516	99,99%
Admission Errors	**5,29**	**2,74**	**37,98 h**	**257,23 h**	**2606**	**34,67%**
E-Sign	0,91	1,52	48,26 h	154,67 h	447	5,95%
Enrollment	0,73	2,72	36,47 h	264,57 h	360	4,79%
Signature	0,6	1,57	16,62 h	80,82 h	296	3,94%
Enrolled	0,52	3,03	36,98 h	330,53 h	258	3,43%
FA	0,48	2,92	49,28 h	290,6 h	235	3,13%
Populate	0,47	3,23	41,94 h	350,12 h	232	3,09%
Stage	0,4	2,8	47,76 h	356,2 h	196	2,61%
EA	0,39	3,37	36,89 h	365,54 h	193	2,57%
Transfer	0,38	3,31	40 h	319,27 h	185	2,46%
180	0,13	2,28	28,74 h	245,57 h	64	0,85%
Expected Payment	0,09	2,68	24,13 h	118,19 h	44	0,59%
Not Started	0,07	2,92	24,79 h	206,98 h	36	0,48%
Drop transfer	0,05	3,62	66,3 h	438,6 h	26	0,35%
Re-enrollment	0,04	2,57	39,8 h	173,65 h	21	0,28%
LOA transfer	0,03	2,54	31,81 h	163,17 h	13	0,17%

Note: The above table is a copy of the report pasted here for information on the top Error Categories, as identified by the GEGI Customer Support Representatives. The Admission Errors Category here shows that 35% of all errors are related to the Admission Process.

Appendix I Figure 4. Persistent Error Phenomenon Summary GEGI Report.

The Data of Admission Process Repeated Errors



Note: The above information depicts the summary of the meeting minutes, reports and surveys conducted both at GAMA and GEGI.

Appendix J Table 8: Detailed GEGI Freshdesk Redmine Report on GEGI Support Time.

Granular Data of Admission Process Repeated Errors for GEGI team

Keywords	# of tasks	Spent time
All Tasks	6559	39301,27
Admission Errors	**67**	**263,42**
E-Sign	13	13,00
Signature	0	0,00
Enrolled	3	26,62
FA	0	29,33
Populate	0	0,00
Stage	16	47,03
EA	22	84,00
Transfer	4	33,34
180	0	0,00
Expected Payment	3	23,84
Not Started	0	0,00
Drop transfer	4	6,26
Re-enrollment	1	0,00
LOA transfer	1	0.67

Developers: % of all **tasks**
1,02%

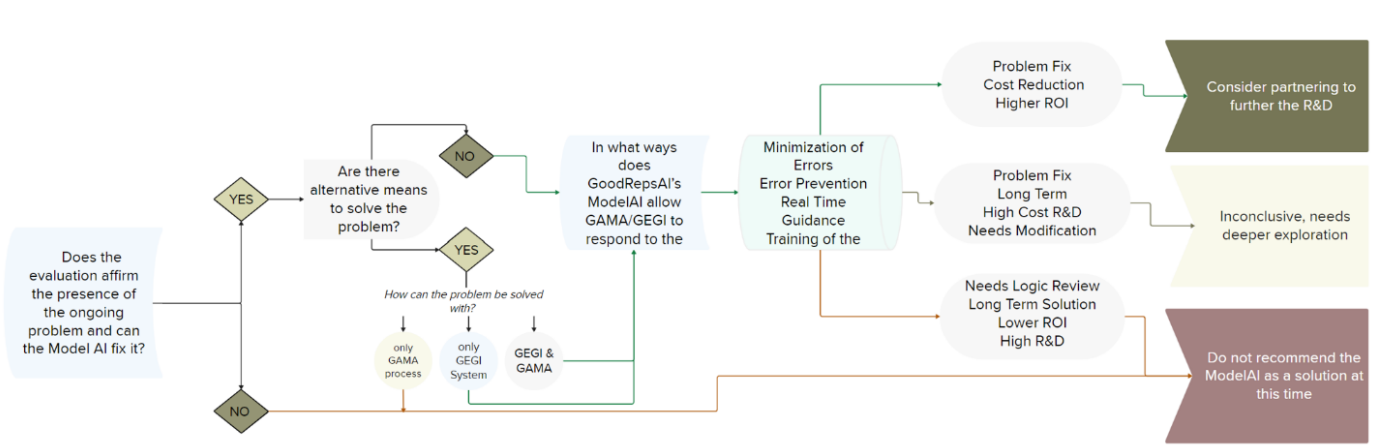
Developers: % of **spent time**
0,67%

Customer Support: % of all **tickets**
2,57%

Note: The above table displays the copy from the Report from GEGI Customer Support Representatives describing the time spent by the GEGI team (both developers and support teams) on the requests regarding Admission Process Errors.

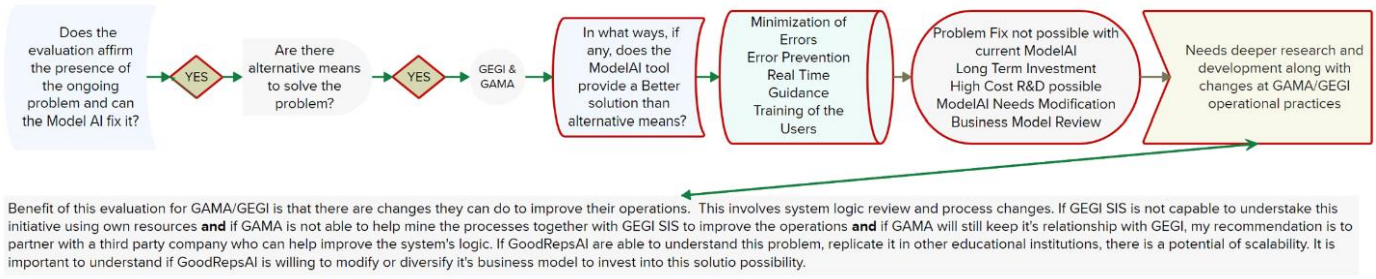
Appendix K Figure 5. Logic Tree in Phase 1&2.

Visual logical evaluation of the sequential design



Appendix L Figure 6. Logic Tree in Phase 3.

Visual logical finalization of the sequential design



Appendix M Key Terms

AI (Artificial Intelligence): Systems designed to imitate human cognitive functions, learn from data, and solve problems. This includes decision support systems, intelligent agents, and expert systems.

Digital Employees / Workers: A category of software robots trained to perform specific tasks or processes in collaboration with human colleagues.

Early Adopters: Individuals or organizations that are among the first to adopt new technologies or innovations, categorized based on the timing of adoption. Early adopters may reap more benefits from new technologies compared to later adopters.

ML (Machine Learning): A subset of AI technology that enables systems to self-learn from patterns in data and make decisions or perform actions without human intervention.

Persistence of Errors: Refers to the recurring errors encountered continuously by users or systems. For instance, during the enrollment process, admission advisors using the Student Information System (SIS) consistently make mistakes in calculating credit granting numbers.

Problem Validation: The process of confirming the existence of recurring errors and determining their causes. This involves investigating whether errors repeat independently of users and identifying whether they are caused by system issues or organizational processes.

Process Mining: A discipline providing tools to gain fact-based insights and support process improvements by analyzing behavior patterns and event data. Also known as Workflow Mining (WM), Business Process Intelligence (BPI), or Automated Business Process Discovery (ABPD).

RPA (Robotic Process Automation): Automation technology that mimics back-office tasks performed by human workers, such as data extraction and form filling.

SOP (Standard Operating Procedures): Manuals found in various departments that outline the processes users must follow to achieve desired objectives. SOPs provide direction and structure for organizational action by specifying what, how, when, why, and who is involved in each process.

TPS (Third-Party Servicer): An external entity or individual that performs specific functions or services on behalf of an educational institution.