Felipe Henrique Moreira Leão, Lucas Henrique Sales Souza

Meu Plantão Amigo : SaaS Platform for Collaborative Medical Support

SÃO PAULO
2025

Felipe Henrique Moreira Leão, Lucas Henrique Sales Souza

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Final Course Project submitted to the Institute of Technology and Leadership (INTELI), to obtain a bachelor's degree in Computer Engineering

Advisor: Prof. Rafael Matsuyama

Coadvisor: Prof. Egon Daxbacher

SÃO PAULO
2025

Cataloging in Publication
Library and Documentation Service
Institute of Technology and Leadership (INTELI)
Data entered by the author.

Leão, Felipe; Souza, Lucas
Meu Plantão Amigo: SaaS Platform for Collaborative Medical Support/ Leão, Felipe; Souza, Lucas; Rafael Matsunaga - São Paulo, 2025

Final Course Project submitted - Computer Engineering / Institute of Technology and Leadership (INTELI)

Resumo

Leão, Felipe; Souza, Lucas. **Meu Plantão Amigo (MPA)**. 2025. 24 folhas. TCC (Graduação) – Curso Engenharia de Computação Instituto de Tecnologia e Liderança, São Paulo, 2025.

A prática médica no início de carreira é frequentemente marcada pela insegurança diagnóstica e pela ausência de suporte imediato durante os plantões, uma lacuna crítica validada por pesquisa de mercado que indicou que 80% dos médicos residentes sentem incerteza em decisões clínicas complexas. O presente trabalho tem como objetivo o desenvolvimento, a implementação e a validação do plano de negócios da plataforma "Meu Plantão Amigo" (MPA), uma solução SaaS (*Software as a Service*) projetada para mitigar esse problema através do suporte médico colaborativo em tempo real. A metodologia adotada combinou a análise de viabilidade econômica e mercadológica com o desenvolvimento de software ágil, resultando na criação de um aplicativo móvel desenvolvido em Flutter e um *backend* robusto em Python com o *framework* FastAPI. A arquitetura técnica integra serviços de autenticação e banco de dados via Supabase, sistema de filas com RabbitMQ e notificações *push* via Firebase, garantindo escalabilidade e segurança de dados. O modelo de negócio proposto é híbrido, sustentado por assinaturas recorrentes (*Freemium* e *Premium*) e um *marketplace* de interconsultas, com a monetização gerida através da API do Stripe. Os resultados obtidos compreendem a entrega de um Produto Mínimo Viável (MVP) funcional que operacionaliza o *matchmaking* automático entre médicos generalistas e especialistas, oferece ferramentas de cálculo clínico e disponibiliza conteúdo educacional curado. As projeções financeiras e a estratégia de *Go-to-Market* demonstram a viabilidade do projeto, com estimativas de crescimento baseadas em métricas de CAC e LTV saudáveis. Conclui-se que o MPA soluciona uma dor latente no ecossistema de saúde, oferecendo uma ferramenta tecnologicamente eficaz para reduzir a ansiedade profissional, promover a educação continuada e, consequentemente, elevar a segurança e a qualidade do atendimento ao paciente.

Palavras-Chave: [Telemedicina]; [SaaS]; [Flutter].

ABSTRACT

Leão, Felipe; Souza, Lucas. **Meu Plantão Amigo (MPA)**. 2025. 24 pages. TCC Major – Computer Engineering of Institute of Technology and Leadership, São Paulo, 2025.

Medical practice in the early stages of a career is frequently characterized by diagnostic insecurity and the absence of immediate support during shifts, a critical gap validated by market research indicating that 80% of resident doctors feel uncertainty in complex clinical decisions. This work aims to develop, implement, and validate the business plan for the "Meu Plantão Amigo" (MPA) platform, a SaaS (Software as a Service) solution designed to mitigate this issue through real-time collaborative medical support. The adopted methodology combined economic and marketing feasibility analysis with agile software development, resulting in the creation of a mobile application developed in Flutter and a robust backend in Python using the FastAPI framework. The technical architecture integrates authentication and database services via Supabase, a message queue system with RabbitMQ, and push notifications via Firebase, ensuring scalability and data security. The proposed business model is hybrid, sustained by recurring subscriptions (Freemium and Premium) and an inter-consultation marketplace, with monetization managed through the Stripe API. The results obtained include the delivery of a functional Minimum Viable Product (MVP) that operationalizes automatic matchmaking between general practitioners and specialists, offers clinical calculation tools, and provides curated educational content. Financial projections and the Go-to-Market strategy demonstrate the project's viability, with growth estimates based on healthy CAC and LTV metrics. It is concluded that MPA addresses a latent pain point in the healthcare ecosystem, offering a technologically effective tool to reduce professional anxiety, promote continuing education, and, consequently, improve the safety and quality of patient care.

Keywords : [Telemedicine]; [SaaS]; [Flutter].

List of Illustrations

Summary

1 Introduction

Medical practice, particularly in the early years of a career, is characterized by significant challenges related to clinical decision-making under pressure. The residency period and the first shifts are critical moments where diagnostic insecurity and the lack of immediate supervision can impact the quality of patient care. In Brazil, with over 500,000 active doctors, a significant portion is in the training phase or recently graduated, facing the "loneliness of the shift."

1.1 Context and Motivation:

- The medical landscape in Brazil has undergone significant transformation in the last decade. With over 500,000 active physicians, the country sees a substantial influx of newly graduated professionals entering the workforce annually. However, the geographic distribution of this workforce presents a severe imbalance. **Data indicates that state capitals house only 23% of the country's population but concentrate 52% of all physicians. In stark contrast, interior municipalities account for 77% of the population yet rely on only 48% of the medical workforce.**

- This demographic disparity exacerbates the challenges faced by professionals in remote or underserved areas. A considerable portion of these professionals begin their careers in emergency shifts and urgent care units, often immediately after graduation. While technical training during undergraduate studies is rigorous, the transition to autonomous practice involves a high degree of responsibility and pressure.

- In this context, the "loneliness of the on-call shift" emerges as a critical phenomenon. Junior doctors frequently face complex clinical cases without immediate supervision or a support network, leading to diagnostic insecurity and professional anxiety. Concurrently, the digital health market (Healthtech) has experienced exponential growth, accelerated by the regulation of telemedicine. However, while most

existing solutions focus on patient-doctor interactions or static content repositories (digital libraries), there is a distinct market opportunity for **collaborative telemedicine**: a synchronous connection between professionals to solve real-time clinical doubts. This project is motivated by the need to fill this gap, leveraging technology to democratize access to high-level specialized medical opinion.

1.2 Problem Definition and Value Proposition:

- The core problem identified—the "Customer Pain Point"—is the **diagnostic insecurity and lack of immediate support** faced by resident and generalist physicians during their shifts. Market research indicates that 80% of these professionals experience uncertainty when making clinical decisions in isolation. This insecurity is exacerbated by the dispersion of medical information across multiple, often unverified sources, and the difficulty in accessing experienced specialists for a second opinion during unconventional hours (nights and weekends).
- To alleviate this pain, **Meu Plantão Amigo (MPA)** proposes a SaaS (*Software as a Service*) platform that acts as a bridge for collaborative knowledge. The **Value Proposition** is centered on providing a "pocket specialist." By enabling real-time inter-consultations through a mobile application, the solution reduces the junior doctor's anxiety, validates clinical conduct, and promotes on-the-job learning. For the specialist, the platform generates value by offering a flexible way to monetize idle time and knowledge, creating a symbiotic ecosystem where the ultimate beneficiary is the patient, who receives safer and more accurate care.

1.3 Objectives of the Work:

General Objective

The primary objective of this work is to create and validate a computational solution for real-time medical support and to develop a comprehensive business plan to guide its introduction and sustainability in the Brazilian market.

Specific Objectives

To achieve the general objective, the following specific goals were defined:

- **Develop a Minimum Viable Product (MVP):** Engineer a mobile application using Flutter and a backend in Python (FastAPI) capable of handling real-time messaging and automatic matchmaking.
- **Validate the Solution:** Conduct tests with a closed group of medical residents to assess usability, latency, and the effectiveness of the inter-consultation flow.
- **Define the Revenue Model:** Structure a hybrid monetization strategy combining recurring subscriptions (SaaS) and transactional fees (Marketplace), validated through financial projections.
- **Establish Architecture and Security:** Design a software architecture that ensures scalability via message queues (RabbitMQ) and compliance with data protection regulations (LGPD).

1.4 Justification and Contributions:

The development of MPA is justified by its relevance across three pillars: **market, technological, and economic**.

- **Market Relevance:** The project addresses a validated demand in the booming Healthtech sector, offering a solution that moves beyond static digitization to functional, human-centric collaboration.
- **Technological Relevance:** The project contributes to the academic field by demonstrating the implementation of a modern, scalable event-driven architecture using RabbitMQ to solve the challenge of real-time availability in critical services.
- **Economic and Social Relevance:** Economically, it creates a new revenue stream for the medical class (specialists). Socially, it contributes to the

mitigation of medical errors derived from inexperience, potentially reducing costs for healthcare institutions and saving lives.

1.5 Work Structure:

This document is organized to present the logical evolution of the project, from conception to validation:

- **Chapter 2 (Solution Development):** details the methodology used, the market premises, the competitive analysis, and the technical specifications of the developed software.
- **Chapter 3 (The Business Plan):** presents the strategic planning, including the marketing plan, operational structure, and financial projections for the first five years.
- **Chapter 4 (Validation and Results):** describes the MVP features, the results of the initial tests, and the analysis of the metrics obtained.
- **Chapter 5 (Conclusion):** synthesizes the main findings, the limitations of the current study, and suggestions for future work.

2 Solution Development

This chapter details the journey of the "Meu Plantão Amigo" (MPA) project, moving from the identification of market gaps to the technical implementation and strategic structuring of the business. It encompasses the definition of hypotheses, market sizing, competitive analysis, software architecture, and the comprehensive business plan.

2.1 Definition of Market Assumptions and Hypotheses:

This section details the strategic analysis and definition of the market assumptions that guided the development of the project, as well as presenting the hypotheses that guided it.

2.1.1 Problem Hypothesis

The central assumption regarding the customer's pain point posits that **newly graduated physicians and residents (Public X) face severe insecurity and a lack of immediate support during shifts (Problem Y), and they are willing to pay to mitigate the risk of medical error.** Specifically, the hypothesis assumes that the geographic imbalance of specialists—where 52% are concentrated in capitals—leaves the 77% of the population in interior regions attended by generalists who lack immediate supervision.

2.1.2 Solution Hypothesis

The assumption is that **a mobile application offering real-time, synchronous inter-consultations with vetted specialists is the most effective way to solve the problem.** Unlike static reference books or asynchronous forums, a direct channel (chat/video) provides the immediate validation required during critical care moments, acting as a "pocket preceptor."

2.1.3 Value Hypothesis

The hypothesis is that **the target customer finds a hybrid monetization model acceptable.** It is assumed that junior doctors perceive a monthly subscription fee (SaaS) or a pay-per-use fee as a justifiable investment in their professional safety and education, provided the cost is lower than the potential legal or reputational costs of a medical error.

2.2 Market Sizing and Analysis:

[In this subsection, the author should indicate the results of the calculations or estimates of market size obtained through the use of the TAM, SAM, and SOM tools, and a details of the customer profile.]

2.2.1 Market Size (TAM, SAM, SOM):

- **TAM (Total Addressable Market):** According to the Federal Council of Medicine (CFM, 2024), there are approximately **575,000 active physicians** in Brazil. This represents the theoretical maximum limit of the market, encompassing all medical professionals regardless of specialty or career stage.
- **SAM (Serviceable Available Market):** This segment filters the TAM to focus on the solution's specific niche: physicians with up to 10 years of graduation (generalists and residents) and those acting as specialists interested in mentorship. Estimating this group at approximately 30% of the active workforce, the SAM is calculated at **172,500 physicians**.
- **SOM (Serviceable Obtainable Market):** This represents the achievable market share in the first year of operation. Adopting a conservative strategy focused on early adopters and partnerships with residency programs, the goal is to capture approximately **1,000 paying users**, representing roughly 0.6% of the SAM.

2.2.2 Customer Segmentation and Profiling

The platform addresses two distinct profiles (Personas):

1. **Jorge (The Mentee):** A 27-year-old medical resident or generalist working in emergency shifts. He is digital-native, feels "imposter syndrome," and values quick, reliable answers over extensive reading during work hours.
2. **Dr. Renato (The Mentor):** A 45-year-old established specialist. He seeks to optimize his downtime between appointments, monetize his expertise, and stay connected with academic discussions.

2.3 Competitive Analysis and Differentials:

In this subsection, the analysis of the market and the business environment is presented, identifying competitors and the differentiators that highlight the competitive advantage.

Identification of Direct and Indirect Competitors

- **Indirect Competitors: Afya Whitebook** and **DynaMed**. These are the market leaders in clinical decision support but function primarily as static digital libraries.
- **Direct Competitors: Medway** and **Figure 1**. These platforms offer education and case discussion but operate largely on an asynchronous model (courses or forums) rather than real-time support.

Figure 1: Direct Competitors

Analysis of Competitors

Competitors like Whitebook excel in content depth and have high market penetration. However, their weakness lies in the lack of human interaction; they provide the "what" (protocols) but not the "how" (clinical judgment in ambiguous cases).

Definition of Competitive Advantage and Differentiating Factor

The **Differentiating Factor** of MPA is **synchronicity**. The platform's competitive advantage lies in its algorithm-driven matchmaking system that connects a user to a human specialist in under 15 minutes. While competitors offer information, MPA offers **mentorship and validation**, drastically reducing the cognitive load on the junior doctor.

2.4 Technological Solution

This section presents the technological and computational solutions developed to support the business model.

2.4.1 Requirements and Specifications:

- Functional Requirements: These requirements define the specific behaviors and functions of the system, inferred from the API endpoints (controllers), mobile screens, and service logic.
  The system must allow user registration with CRM validation; enable the request of inter-consultations by specialty; perform automatic matchmaking via queues; support real-time chat (text/images); and process payments via Stripe.

1. User Management
    - Registration & Authentication: Users must be able to sign up and log in to the application (UserResource, login.dart, sign_up.dart).

    - Profile Management: Users can view and manage their profiles (profile.dart).
    - Role Validation: The system validates user tokens and sessions (UserValidationMiddleware).
2. Interconsultation System
    - Request Interconsultation: Users can request medical interconsultations (InterconsultationResource).
    - Manage Requests: The system handles the lifecycle of interconsultation requests (interconsultation.py).
3. Real-time Communication (Chat)
    - Messaging: Users can exchange messages in real-time (ChatResource, chat.dart).
    - Chat History: Users can view the history of their conversations (chat_history.dart).
    - Asynchronous Processing: The system processes messages asynchronously (consumer_thread.py, main_consumer.py).
4. Medical Tools & Content
    - Medical Calculators: The system provides medical calculators for clinical use (CalculatorResource, calculators_tab.dart).
    - Blog/Educational Content: Users can access a blog or educational content feed (BlogResource, blog_tab.dart).
5. Payments & Subscriptions
    - Subscription Management: Users can subscribe to plans (subscription_payment.dart).
    - Payment Processing: The system processes payments securely (PaymentResource, payment.py).
6. Notifications
    - Push Notifications: The system sends push notifications to users (NotificationResource, firebase_messaging).

- Non-Functional Requirements: These requirements define the system's quality attributes, technical constraints, and performance standards, inferred from the

configuration files (requirements.txt, pubspec.yaml, Dockerfile) and architectural patterns.

The system must ensure low latency (real-time communication); guarantee data privacy in compliance with LGPD (anonymization of patient data); and provide high availability (99.9% uptime).

1. Technology Stack
    - Backend: Must be built using Python with the FastAPI framework.
    - Mobile: Must be developed using Flutter (Dart) for cross-platform support (Android/iOS).
    - Database: Uses PostgreSQL (via Supabase) for data persistence.
    - ORM: Uses SQLAlchemy for database interactions.
2. Security
    - Authentication: Must use JWT (JSON Web Tokens) for secure API authentication (PyJWT, gotrue).
    - Secure Storage: Mobile app must securely store sensitive data like tokens (flutter_secure_storage).
    - Environment Configuration: Secrets and configuration must be managed via environment variables (python-dotenv).
3. Integrations
    - BaaS (Backend as a Service): Integrates with Supabase for authentication and database services.
    - Payments: Integrates with Stripe for payment processing (stripe, flutter_stripe).
    - Notifications: Integrates with Firebase Cloud Messaging for push notifications (firebase-admin, firebase_messaging).
4. Architecture & Scalability
    - Containerization: The application must be containerized using Docker (Dockerfile, docker-compose.yml).
    - Message Queuing: Uses RabbitMQ (implied by pika) for asynchronous task processing and decoupling services.

    - Concurrency: Utilizes uvicorn and asyncio for high-performance asynchronous request handling.
5. Code Quality & Standards
    - Data Validation: Uses Pydantic for robust data validation and settings management.
    - Logging: Implements middleware for request/response logging (LoggingMiddleware).
    - Error Handling: Centralized error handling mechanism (APIErrorHandler).

2.4.2 Architecture and Technology:

The solution utilizes a **Client-Server Architecture** with microservices principles for scalability.

- **Mobile Client:** Developed in **Flutter** to ensure a native experience on both iOS and Android.
- **Backend:** Built with **Python (FastAPI)**, chosen for its asynchronous capabilities.
- **Database & Auth: Supabase** (PostgreSQL) is used for persistence and authentication.
- **Messaging: RabbitMQ** manages the matchmaking queues, ensuring requests are distributed efficiently to available specialists.

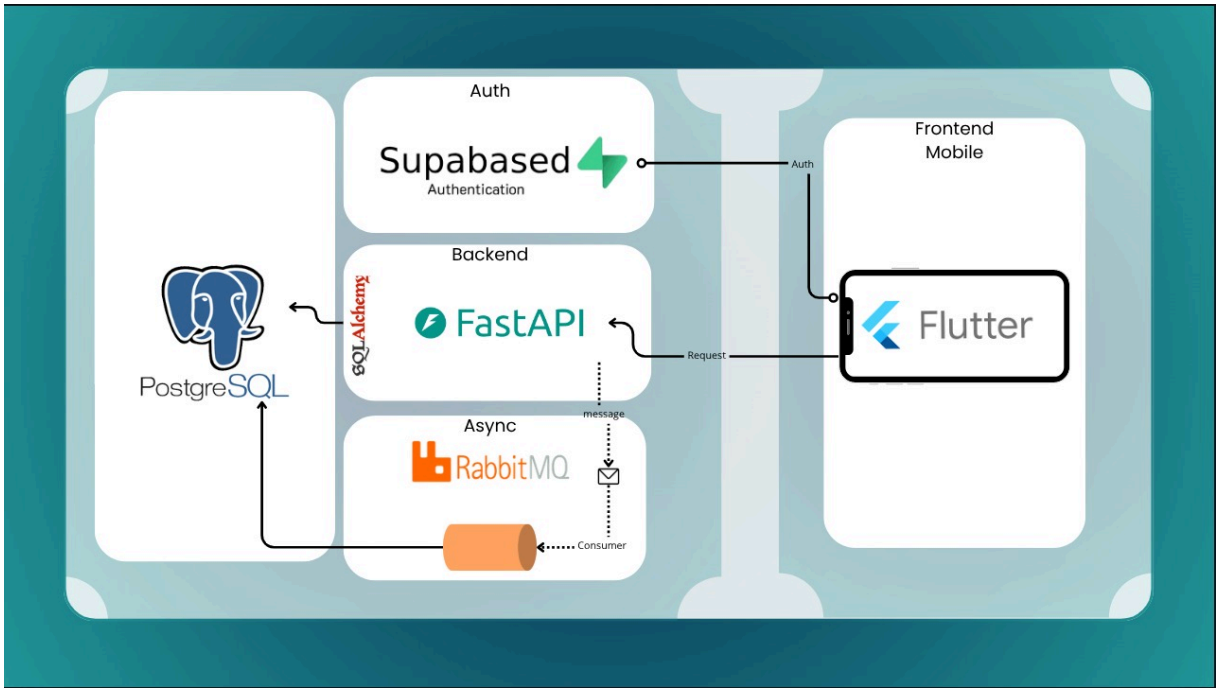

Figure 2: Arquiteture

2.4.3 Development and Implementation (MVP):

- Description of the development methodology (*Scrum* , *Kanban* , etc.);
- Development phases, modules, and features implemented in the **Minimum Viable Product (MVP)** .

2.4.4 Testing and Technical Evaluation:

The development followed the **Agile/Scrum methodology**, organized in 2-week sprints. The **Minimum Viable Product (MVP)** includes:

1. Secure Authentication Module.
2. Inter-consultation Request and Chat Module.
3. Educational Content Feed.
4. Basic Payment Integration.

Testing and Technical Evaluation

Testing strategies included **Unit Testing** for backend endpoints and **Integration Testing** for the Stripe payment flow. Technical evaluation demonstrated that the RabbitMQ architecture successfully handles concurrent requests without data loss, and the mobile app maintains a consistent frame rate on mid-range devices, validating technical robustness.

2.5 The Business Plan

This section presents the strategic structuring of the venture.

2.5.1 Market and Competitor Analysis:

- **Strengths:** First-mover advantage in real-time support; low operational cost structure (software).
- **Weaknesses:** High dependence on the availability of specialists (supply side).
- **Opportunities:** Expansion into B2B (hospitals purchasing subscriptions for staff); partnerships with medical schools.
- **Threats:** Regulatory changes by the CFM regarding tele-interconsultation; entry of Big Techs (Google/Amazon) into the sector.

2.5.2 Business Model (Business Model Canvas - BMC):

The business operates on a **Two-Sided Marketplace** model.

- **Value Proposition:** Security for residents; Income for specialists.
- **Revenue Streams:** Hybrid model combining **Recurring Subscriptions (SaaS)** for access and **Transactional Fees** (20% commission) on pay-per-use inter-consultations.

2.5.3 Marketing and Sales Strategy:

The **Go-to-Market Strategy** focuses on "Ambassador Programs" within residency centers to drive organic growth. Customer acquisition relies on Inbound Marketing (content blogs, SEO) and strategic partnerships with medical student unions. Retention is driven by gamification (badges/levels) and the quality of the educational content feed.

2.5.4 Financial Projection and Feasibility:

The pricing structure is set at **R$ 120.00/month** for the Premium plan. Financial projections indicate an initial investment requirement of **R$ 2.5 million** (Seed Round) to cover personnel and marketing. The break-even point is projected between **Year 4 and Year 5**, with an ROI expected to turn positive as the user base scales and marketing costs per user decrease (network effect).

2.6 Validation and Results

This section demonstrates the market validation of the project.

2.6.1 Validation Methodology:

The validation was conducted through a **Product-Market Fit survey** (Google Forms) distributed to medical residents and generalists, followed by a closed Beta test of the MVP with a small cohort of users.

2.6.2 Market Validation Results:

Data collected confirmed the problem hypothesis: **80% of respondents** admitted to feeling insecure during shifts. Furthermore, 100% of participants validated the utility of a second opinion tool. Feedback indicated a strong preference for the mobile interface over web-based solutions due to the mobility required in hospitals.

2.6.3 Key Performance Indicators (KPIs):

The primary metrics defined for success are:

- **CAC (Customer Acquisition Cost):** Target < R$ 100.
- **LTV (Lifetime Value):** Target > R$ 600.
- **NPS (Net Promoter Score):** Target > 50.
- **Churn Rate:** Target < 5% per month.

2.6.4 Risks and Mitigation Plan:

- **Regulatory Risk:** Mitigation involves constant legal auditing and lobbying with medical entities.
- **Liquidity Risk (Marketplace):** To mitigate the risk of not having enough specialists, the platform uses a "scheduled availability" feature and push notifications to alert offline specialists of high-demand times.

3 Conclusion

The development of the "Meu Plantão Amigo" (MPA) project represented a comprehensive effort to bridge the gap between technological innovation and practical medical needs. By addressing the critical issue of diagnostic insecurity faced by junior doctors—a phenomenon validated by research indicating that 80% of residents experience uncertainty during shifts—this work successfully proposed a robust, scalable solution.

Regarding the **fulfillment of objectives**, the project was successful in achieving its primary and specific goals.

- **Technically**, the development of the Minimum Viable Product (MVP) validated the feasibility of the proposed architecture. The integration of a **Flutter** mobile interface with a **Python (FastAPI)** backend and **RabbitMQ** messaging system proved capable of handling the low-latency requirements essential for real-time inter-consultations.
- **Strategically**, the elaboration of the Business Plan demonstrated the economic viability of the venture. The definition of a hybrid business model, combining SaaS (recurring subscriptions) with a Marketplace (transactional fees), provides a sustainable path to monetization, with financial projections indicating a clear path to break-even by the fourth year.
- **Market-wise**, the application of TAM, SAM, and SOM methodologies allowed for a realistic sizing of the opportunity, identifying a significant "Blue Ocean" in synchronous collaborative telemedicine that competitors like Whitebook or Medway do not currently address.

Future projections for the venture are promising and focus on technological evolution and market expansion.

- **Short Term:** The roadmap includes the implementation of AI-driven algorithms for preliminary case triage and the expansion of the "Ambassador Program" to accelerate organic user acquisition in residency centers.
- **Medium Term:** The strategic pivot to a B2B model is envisioned, offering corporate licensing to hospitals and city halls to standardizing care protocols across their networks.
- **Long Term:** There is potential for internationalization to Portuguese-speaking countries (such as Portugal and Angola) and the integration of deep learning models to assist specialists in differential diagnosis.

Final considerations highlight that MPA is more than a software application; it is a tool for social impact. By democratizing access to specialized knowledge, the platform mitigates the "loneliness of the on-call shift," promotes continuing medical education, and, most importantly, contributes to patient safety by reducing the

likelihood of medical errors derived from inexperience. The project confirms that the intersection of collaborative economy and digital health offers a fertile ground for innovation, providing value to doctors, healthcare institutions, and society at large.

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