Felipe Henrique Moreira Leão

Lucas Henrique Sales Souza

Meu Plantão Amigo : SaaS Platform for Collaborative Medical Support

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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

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RESUMO

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

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.

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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

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.

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

This section quantifies the market opportunity for the proposed solution using the TAM, SAM, and SOM framework, followed by an analysis of the primary customer segments.

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.

Indirect competitors, such as Afya Whitebook and DynaMed, are the market leaders in clinical decision support but function primarily as static digital libraries. In contrast, direct competitors like Medway and Figure 1 focus on medical education and case discussion but operate largely on an asynchronous model (courses or forums) rather than real-time support.

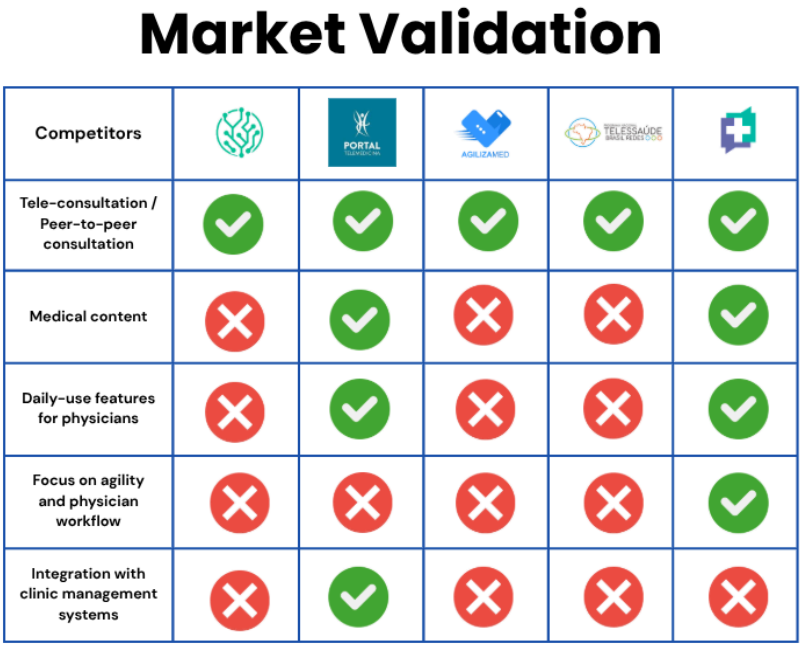

Figure 1: Direct Competitors

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).

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

The system's functional capabilities are designed to support a seamless medical workflow, starting with a secure user registration process that requires mandatory CRM validation. Once authenticated, the platform enables physicians to request inter-consultations by specialty, triggered by an automatic matchmaking system that manages demand through intelligent queues. Real-time interaction is facilitated via a dedicated chat interface supporting both text and image exchange, while the lifecycle of these consultations is managed by a robust service logic that ensures data persistence and history tracking. Beyond the core consultation feature, the system integrates essential clinical tools, such as medical calculators and an educational blog feed, all supported by a secure payment processing layer via Stripe for subscription management. These functions are complemented by a push notification system that ensures high user engagement and responsiveness.

From a non-functional perspective, the architecture is engineered to meet high-performance standards and strict legal compliance. The system ensures low latency to support real-time communication and is built for high availability, targeting a 99.9% uptime to remain reliable in clinical environments. Furthermore, data privacy is a foundational priority, with the system implementing patient data anonymization and security protocols in strict accordance with LGPD regulations.

The technical foundation of the platform relies on a modern stack centered on performance and scalability. The backend is developed using Python with the FastAPI framework, leveraging Uvicorn and Asyncio to manage high volumes of concurrent requests. For the mobile interface, the Flutter framework was selected to ensure cross-platform compatibility for Android and iOS. Data persistence is handled by a PostgreSQL database managed via Supabase, with SQLAlchemy serving as the Object-Relational Mapping (ORM) tool to ensure structured and efficient database interactions.

Security and integration are addressed through a multi-layered approach. The system implements JWT (JSON Web Tokens) for API authentication, while sensitive mobile data is protected using Flutter Secure Storage. External integrations are vital to the ecosystem, including Stripe for financial transactions, Firebase Cloud

Messaging for push notifications, and RabbitMQ for asynchronous task processing. To ensure long-term maintainability and code quality, the project utilizes Pydantic for data validation, Docker for containerization, and a centralized middleware system for logging and error handling. This architectural choice ensures that the system remains modular, scalable, and resilient as the user base grows.

2.4.2 Architecture and Technology

The solution is designed under a hybrid architecture, combining the **Client-Server** pattern for direct interactions with an **Event-Driven** approach for asynchronous processing, as illustrated in **Figure 2**. This architecture choice aims to meet non-functional requirements such as high availability, low latency, and horizontal scalability, which are essential for the medical matchmaking workflow and real-time chat.

The user interface is developed using **Flutter**, ensuring native compatibility for both Android and iOS through a single codebase. This technical decision is driven not only by portability but also by its high-performance rendering engine (Skia), which ensures fluid 60fps animations. This is critical for the usability of the chat interface. Also, sensitive data stored locally utilizes **Flutter Secure Storage**, ensuring that session tokens and residual information are encrypted at rest, adhering to mobile security best practices.

The system's core is built using **Python** with the **FastAPI** framework. Unlike traditional synchronous frameworks (such as Flask), FastAPI operates on the **ASGI** specification (via Uvicorn) and leverages asycio. This allows the system to manage thousands of concurrent connections —necessary for real-time features— without blocking the main thread, directly addressing the low latency requirement. Also, request integrity is enforced by **Pydantic**, which provides strict data typing. This reduces runtime errors and acts as a preventative measure against malicious data injection.

A critical component illustrated in the architectural diagram is **RabbitMQ**, acting as the **Message Broker**. It is responsible for decoupling request reception from heavy processing tasks. When a user requests an inter-consultation, the API sends a message to a RabbitMQ queue rather than processing it immediately. This prevents the FastAPI server from becoming a bottleneck during complex *matchmaking* logic. A separate "Consumer" service (depicted at the bottom of the diagram) reads these messages and executes the logic for queue management and notifications, ensuring the user application remains responsive.

The data infrastructure is supported by **PostgreSQL**, orchestrated via the **Supabase** platform. The interaction between the Python code and the database is mediated by SQLAlchemy. This Object-Relational Mapper abstracts raw SQL complexity and serves as a defense layer against *SQL Injection* attacks. Identity management is offloaded to Supabase Auth (implementing JWT). This centralizes security and facilitates the implementation of **Row Level Security (RLS)** in the database. RLS ensures that physicians can only access patient data for which they have explicit permission, a fundamental pillar for **LGPD (General Data Protection Law)** compliance.

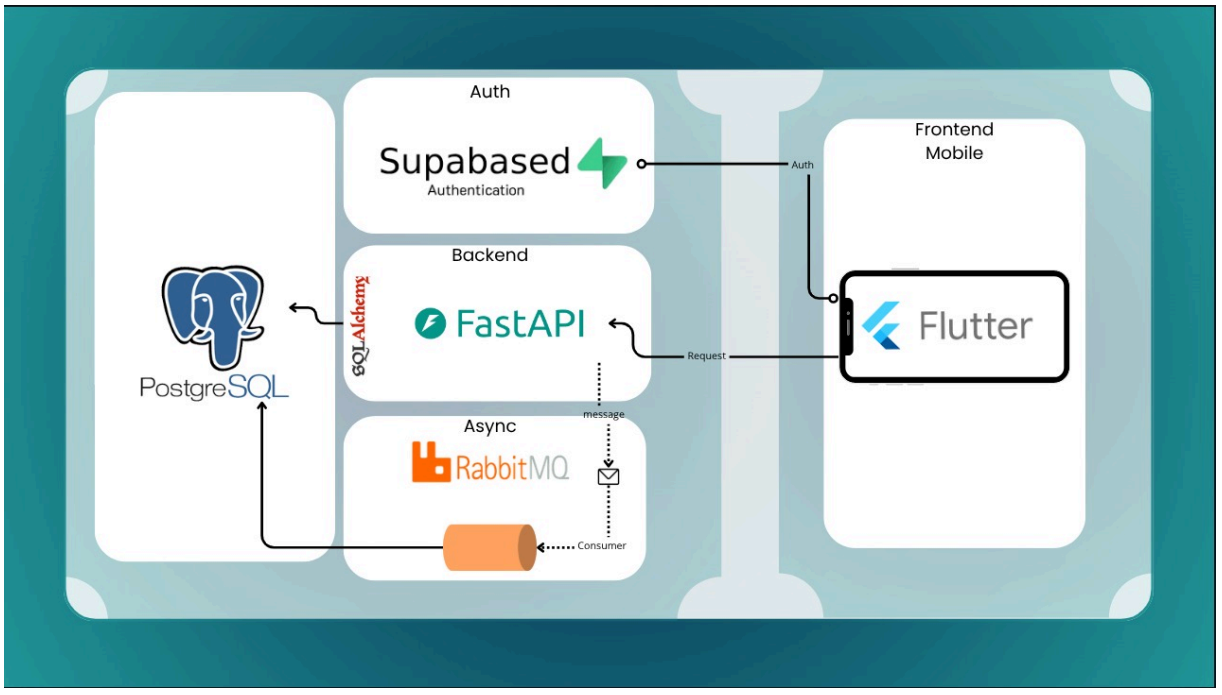

Figure 2: Architecture

2.4.3 Development and Implementation (MVP):

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

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

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, detailing the business model, market analysis, marketing strategies, and financial feasibility.

2.5.1 Business Model (Business Model Canvas - BMC)

The platform operates on a **Two-Sided Marketplace** model, connecting two distinct customer segments with interdependent value propositions. The customer segments include the "demand side," consisting of medical residents and general practitioners (GPs) working in emergency rooms or remote locations who require immediate clinical support. The "supply side" comprises board-certified specialists seeking flexible, high-value monetization of their downtime.

The application’s value propositions are tailored to each group. For residents, it provides immediate access to specialized knowledge, a reduction in clinical error

risks, and emotional security during shifts, acting as a "Second Opinion." For specialists, it offers a flexible income stream that does not require physical presence, allowing them to monetize their intellectual capital efficiently. To maintain these users, the system fosters customer relationships through automated self-service for transactions, community building via gamification (badges/levels), and personalized support for “Ambassador” users.

Regarding channels, the Mobile Application (iOS/Android) serves as the primary delivery interface, supported by a Website for institutional presentation and blog content. Finally, the revenue streams implement a Hybrid Model: a recurring subscription (SaaS) of R$ 120.00/month for platform access (Premium Plan), combined with a 20% transactional commission on pay-per-use priority inter-consultations.

2.5.2 Strategic Analysis (SWOT)

A strategic analysis was conducted to map the internal capabilities against external market forces. Internally, the venture possesses a distinct Strength in its "First-Mover Advantage" regarding real-time synchronous support, coupled with a low operational cost structure inherent to software products. However, a primary Weakness is the high dependence on the liquidity of specialists; the user experience is strictly tied to the availability of the supply side.

Externally, the market presents Opportunities for expansion into B2B models, such as hospitals purchasing subscriptions for their staff, and strategic partnerships with medical schools. Conversely, the business faces Threats, primarily regarding regulatory volatility from the Federal Council of Medicine (CFM) concerning tele-interconsultation and the potential entry of well-capitalized "Big Tech" companies (e.g., Google or Amazon) into the healthcare niche.

2.5.3 Marketing and Sales Strategy:

The **Go-to-Market strategy** focuses on organic growth leveraged by network effects. Customer acquisition relies heavily on "Ambassador Programs" established within major residency centers, where key users drive peer-to-peer adoption. This is complemented by an Inbound Marketing strategy that utilizes an educational blog and SEO techniques to attract traffic through high-value clinical content. To ensure user retention and minimize churn, the platform employs gamification mechanics and continuously updates the educational feed, ensuring the application remains valuable even when users are not actively requesting consultations.

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, this work successfully moved beyond the theoretical proposition to deliver a validated, scalable solution. The project's central contribution lies in defining a technological blueprint for synchronous collaborative telemedicine, a domain often overlooked by existing asynchronous reference tools.

The fulfillment of the project's objectives was measured through distinct validation layers, confirming the efficacy of the proposed solution. **Regarding the validation of the problem hypothesis**, the objective was achieved and measured through a Product-Market Fit survey, where quantitative data revealed that 80% of residents experience insecurity during shifts. Furthermore, the solution's utility was validated by a 100% approval rate among beta testers regarding the necessity of a "second opinion" tool. **From a technical perspective**, the objective of ensuring low-latency communication was met and verified through the implementation of the Event-Driven Architecture. The successful decoupling of services using RabbitMQ and FastAPI proved capable of handling real-time data exchange without blocking main threads, complying with the non-functional requirement of high availability. **Economically**, the objective of demonstrating commercial feasibility was measured through financial modeling. The Business Plan validated the venture's viability by projecting a break-even point by the fourth year, supported by a calculated Customer Acquisition Cost (CAC) target of under R$ 100 and a favorable Lifetime Value (LTV) projection.

Looking forward, the roadmap for the venture focuses on technological evolution and market expansion. In the short term, the project aims to implement AI-driven algorithms for preliminary case triage and expand the "Ambassador Program" to accelerate organic user acquisition in residency centers. In the medium term, a strategic pivot to a B2B model is envisioned, offering corporate licensing to hospitals and municipalities to standardize care protocols. Long-term goals include

internationalization to other Portuguese-speaking nations and the integration of deep learning models to assist specialists in differential diagnoses.

Ultimately, "Meu Plantão Amigo" transcends its definition as a software application; it stands as a tool for social impact and professional safety. By democratizing access to specialized knowledge, the platform directly mitigates the "loneliness of the on-call shift" and promotes continuing medical education. Most importantly, it contributes to patient safety by reducing the likelihood of medical errors derived from inexperience. The project confirms that the intersection of the collaborative economy and digital health offers fertile ground for innovation, providing measurable value to physicians, healthcare institutions, and society at large.

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