

Human Systems Integration (HSI) Project

General practitioners & patients

CentraleSupélec

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Group 4

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Abstract

This study addresses the issue of enhancing general practitioners (GPs)-patient relationships within France's healthcare system, amidst rising demands and the emergence of medical deserts. Utilizing Human Systems Integration (HSI), the project aims to streamline interactions between GPs and patients by focusing on two main challenges: the difficulty in finding and scheduling appointments with GPs, and inefficiencies in managing medical visits and documents.

Through patient interviews, scenario analysis, and a creative solution-generating process, the project proposes two innovative solutions. The first is the "New in Town" (NiT) feature, designed to improve the process of finding a GP and scheduling appointments through enhanced search filters, review systems, and interactive patient tools. The second solution is a sensitization campaign aimed at raising awareness and usage of existing digital platforms for better healthcare management. These strategies aim to foster a more efficient, transparent, and patient-centered healthcare experience in France

1. Introduction

1.1. Context

The healthcare system of a territory represents a major challenge for the quality of life of a population and the economy of a country. In recent years, the need for healthcare has been increasing worldwide [1]. In Europe, especially in France, this need is evident through the tensions observed in hospitals and clinics. Over the past few decades, France has seen the emergence of real medical deserts and a considerable increase in demand for primary care services in urban areas [2]. General practitioners (GP) are thus affected by both the increasing number of patients to treat and the growing administrative burden. Additionally, increasing wait times for clinic appointments and shorter consultation times negatively impact the quality of care and lead to overcrowding in emergency departments by patients unable to secure appointments who simply wish to receive treatment.

In France, there's a special emphasis on improving the connection between general practitioners and patients, seeing primary care as crucial to the healthcare system. General practitioners are essential for offering ongoing and thorough care, being the initial contact for medical concerns. It is therefore essential to focus on improving the relationship between GPs and patients and implement innovative care models to improve patient outcomes and satisfaction.

1.2. Objectives

The project will focus on improving the relationship between general practitioners (GPs) and patients within the French healthcare system, through human systems integration (HSI) lens. By putting human factors at the forefront, we aim to propose a solution that streamlines the workflow between GPs and patients, with a redesigned system that focuses on effective communication and collaboration. This involves designing healthcare systems that prioritize the usability of digital health tools, the accessibility of healthcare services and the integration of patient-centered care approaches.

The main aim is to ensure a positive experience for both GPs and patients.

In the context of Human-Systems Integration (HSI), the problem statement revolves around **enhancing the relationship between general practitioners (GPs) and patients in France by addressing the inefficiencies and lack of awareness surrounding the process of accessing and utilizing GP services.** The overarching goal is to streamline the patient journey, making it both transparent and efficient. Specifically, the project aims to address two key aspects:

Case 1: Finding a GP and having a proper consultation

In navigating the current landscape in France, individuals encounter challenges in locating and scheduling appointments with GPs efficiently. Addressing this issue entails devising solutions to enhance accessibility and streamline the process of finding a suitable GP, while also facilitating appointment scheduling. Additionally, establishing a review system aims to empower patients by providing insights into what to expect from their appointments, fostering more pleasant consultations. Similar to how platforms like Uber utilize review systems to encourage drivers to provide better service, implementing such a system in healthcare can contribute to improved patient experiences and outcomes. The overarching goal is to empower patients in their search for healthcare providers, ensuring not only timely access to medical services but also fostering a supportive and informed healthcare environment.

Case 2: Managing visits to GP and medical documents

The patient-GP interaction involves various administrative tasks and documentations, which can contribute to inefficiencies and confusion for both parties. This aspect aims to address the need for better communication and management of visits to GPs, including the handling of documents and medical records. The project seeks to explore

methods for enhancing communication channels between patients and GPs, as well as improving document management systems to streamline the overall process of healthcare delivery.

2. Methodology

An effective approach tailored to the complexity of the situation involves employing five distinct methods stages that guided the problem-solving process of this present report. Initially, the methodology began by clearly defining the issue at hand and interviewing 6 users (patients) of our system using a qualitative and quantitative approach to comprehend the actual state of art of the problematic. Subsequently, it entailed exploring two scenarios to grasp the full extent of the problem's complexity and potential intricacies. Following this, a creative brainstorming phase ensued, wherein a diverse array of ideas was generated to tackle the identified problem.

These ideas were then carefully refined and developed into viable solutions. Finally, a

rigorous evaluation process was undertaken to assess the feasibility and effectiveness of each solution, culminating in the selection of the most promising one for implementation. This systematic approach ensures a comprehensive problem-solving experience, nurturing innovation and facilitating the development of effective solutions tailored to the context of human system integration in hand.

3. Problem statement

3.1. Mapping pain points

From the brainwriting procedure and interviews with the patients, the following problems were mapped, categorized and showed in the Figure 1.

Category	Problems identified	Consequences
Information about the clinic	<ul style="list-style-type: none"> No rating system No profile photo No photos of the clinic 	<ul style="list-style-type: none"> Lack of confidence Loss of attractiveness of the profession
Information management & making the appointment	<ul style="list-style-type: none"> Difficulty obtaining an appointment without using digital channels (Doctolib, internet, etc.) Need for an appointment for each stage of the same consultation GPs are very busy 	<ul style="list-style-type: none"> Long delays in obtaining treatment Complications for people not used to the system
Consultation	<ul style="list-style-type: none"> Appointment times not respected Overlapping of appointments made by doctors Cultural and linguistic differences Communication not clear Rushed appointments Impossible to contact the doctor if patient has follow-up questions 	<ul style="list-style-type: none"> Uncertainty in patient time management Distant relationship between GP-patient Lack of trust
Availability	<ul style="list-style-type: none"> Shortage of GPs Uneven distribution across the country Difficulty in obtaining follow-ups Delays in submitting imaging reports Reduced staff at night and on holiday 	<ul style="list-style-type: none"> Rural areas are being neglected Some doctors are overwhelmed Waste of time for patients Some patients do not seek treatment/not treated on time

Figure 1 – Pain points and consequences identified.

3.2. Defining the problem

After careful analysis of the current system and pain points, this group chose to approach the problem from the point of view of two situations, differing on the phase of the system and on the profile of the patient.

1. How can technology be leveraged to **streamline the process of finding a suitable general practitioner and scheduling appointments?**
 - In this case, the focus is in improving the moment of scheduling the appointment (phase 1) and the consultation itself (phase 2) for patients who don't have a GP.
 - The existent solutions don't sufficiently satisfy the needs for this population. The solution will focus on proposing new ideas to upgrade current system.
2. What strategies can be implemented to **improve communication channels and raise awareness to document management systems between GP and patients**, thereby optimizing the efficiency and effectiveness of healthcare visits?
 - In this case, the focus is improving the moment of consultation (phase 2) for patients who already frequent the GP.
 - The existent solutions satisfy the needs but are not well-spread amongst the population. The solution will focus on raising awareness to people.

4. Analyzing current state of the art

4.1. Mapping current system

To better understand how patients interact with GPs, the whole process was represented as a flow diagram (Figure 2), taking into account the following considerations:

Identified 7 touchpoints/stakeholders during the relation GP-patient:

- Patient
- Doctolib
- Reception/ Call center
- General practitioner
- Health insurance
- Mutuelle
- Other stakeholders

Divided into three overall processes:

1. Scheduling of the appointment
 - Urgent appointments are directed to Hospitals.
 - Patients decide on video or in-person consultation.
2. Consultation with the doctor
 - Reasons for the consultation includes:
 - Need for immediate care.
 - Need for a certificate.
 - Need for preventative care (e.g. vaccination).
 - Need to refer to other healthcare.
 - Providers (e.g., laboratory, specialist);
 - After the patient is transferred, potentially a follow-up appointment;
 - Patient data is stored in various places.
3. Payment and refund process
 - After the consultation, the patient pays and gets refunded based on his health assurance and complement.
 - Online transmission allows for simple data transfer and automatic reimbursements.
 - An analog process via the mail needs more patient interaction to get the consultation reimbursed.

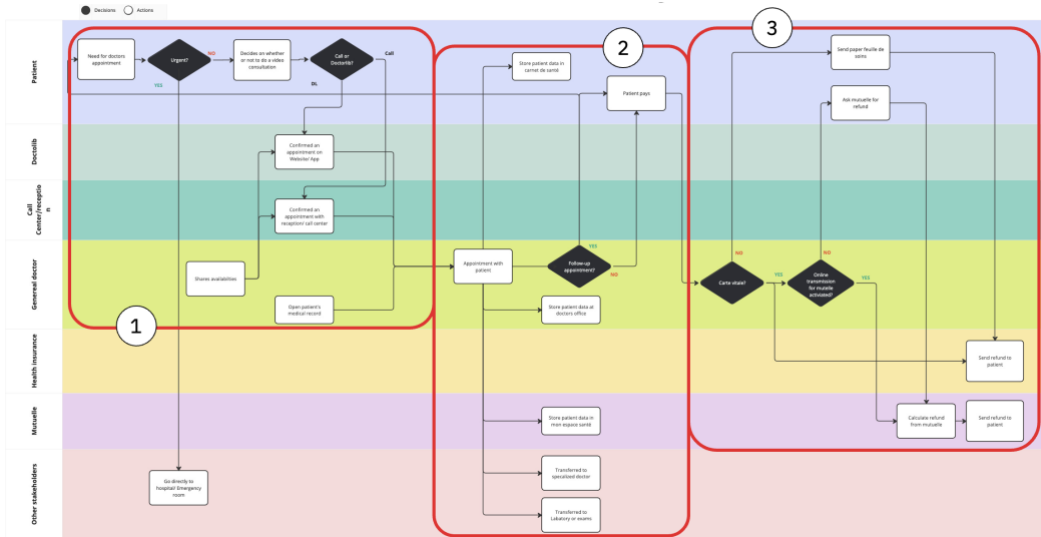


Figure 2 - GP appointment flow diagram.

On top of this, a special focus was made on the process of identifying and selecting a GP to establish a long-lasting relationship (Figure 3).

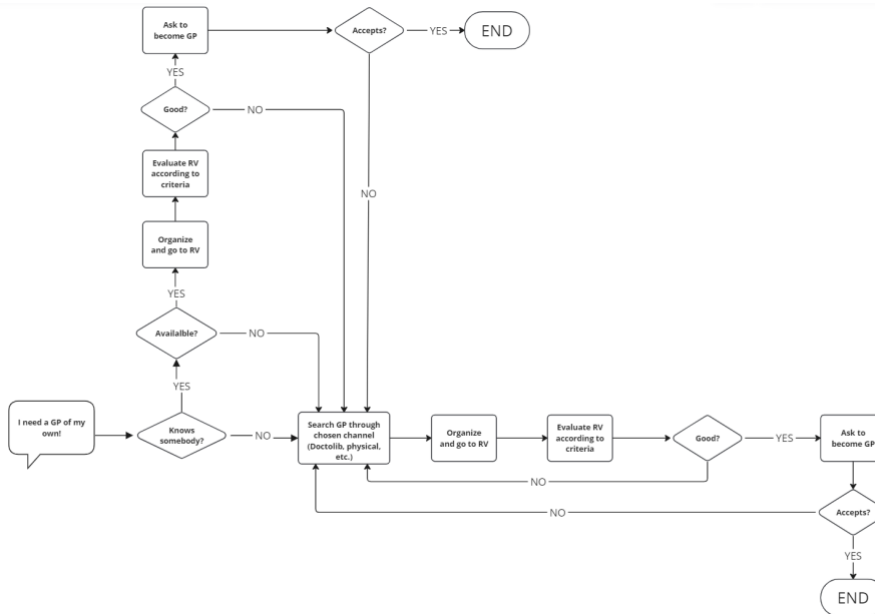


Figure 3 - "Choosing a GP" flow diagram.

4.2. Scenario AS-IS

After understanding the context and the problematic, the scenario-based methodology was adopted. It provided a robust framework for exploring human dynamics within complex systems, leading to more meaningful outcomes aligned with stakeholder goals and values. Therefore, one scenario was designed for each case based on a persona:

- Case 1 - Find a GP and have a pleasant consultation.

Julie, 24 years old, was born in Lyon. She is studying now at CentraleSupélec at Saclay's Campus but she is moving to Marseille to do her internship. Every time she is at a new city she has to search for a generalist practitioner to have a gynecologist follow-up, or to receive a prescription for ordinary medicines, or even just to take a sick leave certificate for School. That classifies as a problem because every time she has to look into Doctolib application, it's difficult to find a doctor that suits her needs and expectations without recommendation from others. When she goes to the consultation, in general, she doesn't know what to expect in terms of time, service method and treatment pathways, and this often leads to a very unsatisfactory consultation. Therefore, she must look

for another doctor and do all this cycle again until she finds one that meets her specific needs. She already did this one time moving to university, and now she has to do this again, knowing how painful it will be.

- **Case 2 - Managing visits to GP**

Marc, 68 years old, lives in Paris. In a recent appointment with a generalist doctor he discovered that he potentially has hypertension. Therefore, the doctor prescribed a lot of blood test and referred him to a cardiologist. He took the blood test and went to the cardiologist, who gave him a pharmacy prescription. Two months later, He was still suffering from the symptoms and went back to the generalist practitioner. The doctor couldn't find his latest blood tests because they weren't in the database and the paper was left with the cardiologist, he also don't remember the name of the medication he is on and this data it is not available in the data base. So he'll have to go through the tests and to the specialist again, which means a loss of money and time.

4.3. Assessing existing solutions

In France, there are already several actors that propose different solutions to deal with some of the issues identified during the analysis. The following classification was realized:

- **Admission into clinic:** fast-track the admission process by making the documentation required available to the clinic before the patients' arrival.
 - Appfine
 - Digihosp
- **Appointment management:** online scheduling for medical appointments.

- Doctolib
- Medicalib

- **Personal dossier:** store online patients' documentation related to medical care to ensure availability and treatment traceability.

- ID-U Santé
- Mon Espace Médicale

Overall, these solutions work properly and have the capability to counter the identified pain points. However, it was discovered that several of them are not well known nor used, limiting the reach of the benefits they provide.

5. Solution

5.1. Brainwriting session

For case 1, a brainwriting session was carried out, proceeding as follows:

Each member of the team proposed ideas on how to find a general practitioner and make an appointment, which served as the foundation for the final solution. Then each idea was developed to be adjusted and further improved. Finally, the team went through a group discussion for a critical analysis of the solutions, allowing for some final modifications and a consequent selection, considering practicality and potential impact. The results from the brainwriting session are available in the figure 4.

	Idea 1	Idea 2	Idea 3	Idea 4	Idea 5
Initial ideas	Create a user-friendly mobile app that uses GPS to locate nearby GPs and display their next available appointment slots.	Develop a "New in Town" feature for the app that specifically assists people who have just moved to the area.	Introduce an AI chatbot on the app that can help users through the process of finding a GP based on symptoms or medical needs.	Implement a priority system for urgent appointments, allowing users to access same-day bookings if necessary.	Offer a virtual waiting room feature to join a queue remotely and receive an approximate appointment time.
Build-up	Add to his mobile app the ability to store user medical profiles for quick registration and personalized GP recommendations.	For the "New in Town" feature, include community ratings and reviews to guide new residents in choosing a trusted GP.	Enhance the AI chatbot to schedule appointments directly within the chat interface and send reminders.	Include an option for GPs to mark last-minute cancellations so patients can grab the slots in case of emergencies.	Implement a notification system in the virtual waiting room to update patients on their status via SMS or the app.
Enhancement	Integrate the app with local health systems for seamless transfer of medical records with patient consent.	Propose partnerships with local clinics to provide a reliable database for the "New in Town" feature.	Use machine learning to improve recommendations over time based on user feedback.	Add a feature for users to flag their appointments as urgent, triggering a notification for GPs to review the urgency.	Add an analytics dashboard for GPs to manage their virtual queues and patient flow more efficiently.
Finalization	Propose a loyalty system within the app to encourage patients to leave feedback after each GP visit.	Consider adding a social element where users can share experiences and tips about navigating local healthcare.	Plan for the AI chatbot to follow up with patients post-appointment to gather data on satisfaction and outcomes.	Offer an extended support feature for after-hours health questions, directing to appropriate care if needed.	Sync the virtual waiting room feature with smart home devices for real-time updates.

Figure 4 - Proposed solutions.

5.2 Mock-up: Case 1

The proposed solution to deal with pain points in Case 1 is the "New in Town" (NiT)

feature, which adds some specific functionalities to any existing online appointment scheduling app to better align it

with the needs of somebody who is in a situation like the one described in said case. NiT is composed of 5 main sections: Filtering, Reviews, Frequently Asked Questions (FAQ), Forum and Chatbot.

With the addition of more specific filtering options, patients will be able to refine their search in terms of location, refund type, GP's availability to take new patients, language, reviews' score, and gender preference.

In the Reviews' section, patients will have the possibility to rate the service received according to different criteria, like communication, treatment, and overall satisfaction. Any future patient will have this information at their disposal to be better informed when choosing their GP.

The FAQ section is a quick and simple approach to tackle the most frequent doubts patients might have about the app, or how the health system works in general. By integrating them into the app, patients can check them out if any question arises.

As the FAQ is limited to a relatively small set of questions, the Chatbot is introduced. It is an interactive way to ask more specific questions, with the possibility of explanation, reformulation, and clarification. On top of this, it is possible to input information via audio, photos, or documents.

Finally, the forum section aims at connecting patients with each other. It allows users to know other people's point of view, share tips and experiences, and answer questions that even the Chatbot could not fully answer.

5.3 Scenario TO-BE: Case 1

After analyzing the proposed solution, a new scenario was created based on its impact on the scenario AS-IS:

Julie, 24 years old, was born in Lyon. She is studying now at CentraleSupélec at Saclay's Campus but she is moving to Marseille to do her internship. Every time she is at a new city she must search for a GP to have a gynecologist follow-up, or to receive a prescription for ordinary medicines, or even just to take a sick leave certificate for School. But this is not a problem anymore

because now, when she opens the app's feature "New in Town", she can filter doctors by reviews as well as being able to carry out a generalist search through the app's FAQ, pose specific questions and shared experiences with other patients on the Forum and ask for help for the chatbot. The return from other patients and the use of filters improved her experience in the consultation a lot because now she knows what to expect. In addition, as there is an explicit system for evaluating doctors, they are encouraged to provide the best possible care, improving also the experience. This way, the process of finding a doctor is no longer a point of stress when moving cities.

5.4. Mock-up: Case 2

As seen, in the scenario of healthcare in France, numerous data storage platforms already exist, yet a prevalent issue lies in their lack of widespread recognition. To address this, a solution was proposed: launching a sensitization campaign aimed at raising awareness about these platforms. This initiative entails leveraging the State budget to support the campaign, orchestrating multi-channel communications across various platforms such as TV, social media, and billboards.

Additionally, a targeted effort will be directed towards medical staff, while also incentivizing general practitioners and other medical professionals to encourage their patients to engage with these platforms.

5.5 Scenario TO-BE: Case 2

The same analyze was done for the case 2 and a new scenario was designed:

Marc, 68 years old, lives in Paris. In a recent appointment with a generalist doctor, he discovered that he potentially has hypertension. Therefore, the doctor prescribed a lot of blood test and referred him to a cardiologist. He took the blood test and went to the cardiologist, who registered his results in the system because he is constantly encouraged by the public system to use the available platforms and gave him a pharmacy prescription. Marc registered the name and details of his medicines in his platform's personal space because he saw how to do it in a break of a TV show. Two months later, he was still suffering from the symptoms and went back to the generalist practitioner. The doctor could find his latest blood tests and the details of his medications because everything was in the database. So, the consultation was much more efficient, optimizing the time of the patient and the doctor.

6. Conclusion

The objective of this project was to enhance the relationship between GPs and patients in France by addressing the inefficiencies and lack of awareness surrounding the process of accessing and utilizing GP services. To do so, two cases were analyzed and targeted: finding a GP and having a proper consultation and managing visits to GP and documents.

To address this issue within the framework of Human Systems Integration, a methodological approach was adopted. The problem was clearly identified, with insights gained from interviews conducted with impacted patients. Additionally, the development of a user-centric solution was informed by two scenarios, culminating in a creative brainwriting session aimed at crafting an innovative and user-focused solution.

As a result, the “New in Town” feature is introduced, which adapts existing online appointment scheduling apps to better suit the needs of people in situations like Case 1. The advantages of NiT include a centralization of the information, the implementation of an AI assistant to clear specific doubts, the introduction of more refined filtering parameters, and the integration of patients’ feedback. This results in a more transparent process, which enables a better-informed GP selection.

On the other hand, after investigating current solutions that aim at dealing with the problems presented in Case 2, it was determined that the already-existing solutions had an adequate performance. However, as they are relatively unknown to the public, their potential is not completely exploited. To tackle this issue, the proposed solution is a large-scale marketing campaign, which would increase the solutions’ visibility. This alternative presents itself as simpler and faster compared to developing from zero the different elements required to deal with the pain points presented in Case 2. All this translates into time optimization and the immediate possibility to profit from existing solutions.

7. References

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Annex

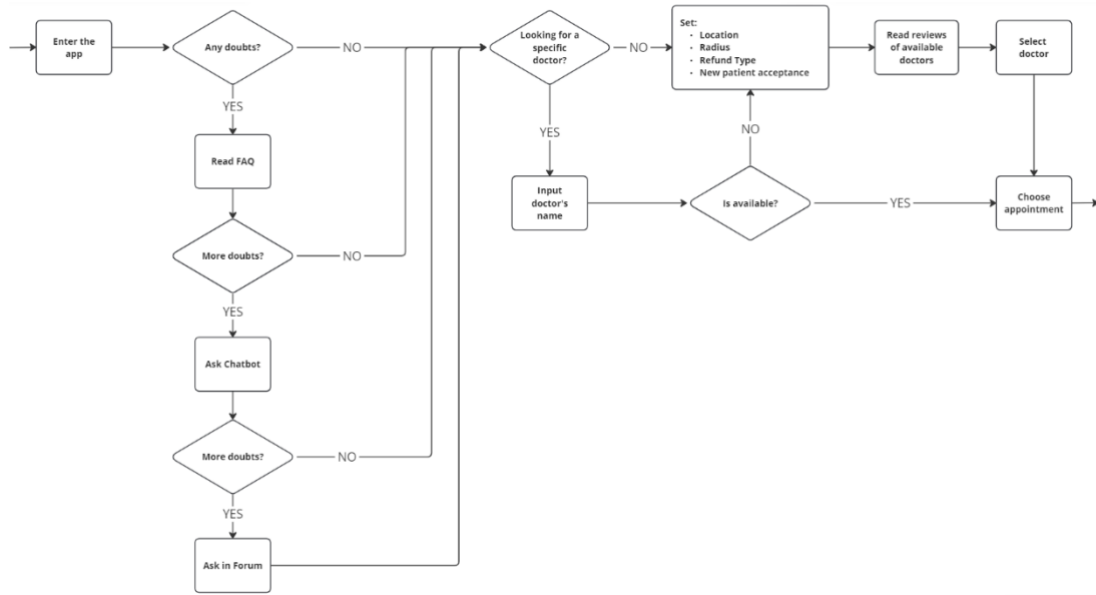


Figure 5 - "Finding a GP with NiT" flow diagramme.



Figure 6 - Mock-Up interfaces: Homepage, FAQ, Forum, Chatbot, Reviews.