

Case Studies : Introduction

Proposed Answers

Case 1 : Stakeholders Analysis

Context:

Case inspired from: [Welcoming an end to paper-based healthcare - Technology Record](#)

As a software engineer in the medical sector, your goal is to reduce wait times and improve patient experiences. Previously, hospitals used paper-based records, which were costly and caused delays in delivering documents to clinicians. To address these issues, digital solutions were implemented to give staff immediate access to case notes.

You developed an electronic document and records management software to replace paper. This software allows healthcare professionals to access patient records quickly. Thanks to metadata and indexing, the digital archive now supports quick and advanced searches. The system integrates with other IT services of the hospital and supports simultaneous access by multiple users. A component with Optical character recognition (OCR) is designed to facilitate the conversion of previous paper documents into digital versions.

Exercise:

The goal of this exercise is to make you use the strategy "Stakeholder analysis" seen in the videos.

1. Brainstorm a first list of stakeholders
2. Use the questions in order to find other stakeholders of your software. Go through all the questions and try to find at least 6 stakeholders
3. Use the Direct vs Indirect chart to find at least 2 other stakeholders
4. For each stakeholder, establish whether your software puts it at risk and briefly describe the potential impact.

Proposed answer:

1. First list of stakeholders:

- **You**, the developer
- The **hospital direction** which pushed the usage of software
- The **healthcare professionals**
- The **patients**

2. Expanding the scope with questions:

Here we used the [questions proposed by the Markkula Center](#):

- Does your design complete jobs that are currently done by people?
Yes, **secretaries** will no longer need to use the archive room or find documents for healthcare professionals
- Can it potentially pose a legal risk to the people that own or operate it?
Yes, health data is highly sensitive because it represents very private information, and it is explicitly protected in Data Protection Laws in Europe and Switzerland. Conformity with these laws must be ensured (e.g. explicit consent from patients). In addition, if a file leaks the professional secrecy will be broken. Therefore the **IT department of the hospital** needs to make the database really secure to avoid this.
- Will your design threaten local businesses and the local economy?
The **paper supplier** of the hospital will see its business drop significantly.

- What resources does your design expend in [...] operation ?
Computers and servers providers will see their demands increase.
3. **Using the Direct vs Indirect chart:**
- **Natural Environment**
 - **Electricity supplier**
 - **IT service providers**
 - **External medical practices** (e.g. which send patients to do a scan at the hospital)
 - **Other hospitals** (e.g. when they transfer patients)
4. **Stakeholders put at risk:**
- **Patients** and their privacy
 - **Secretaries**, they need adapt and learn this new tool
 - The **IT department of the hospital** which is responsible for the security of the software
 - The **paper supplier**, who will see its business drop
 - The **natural environment**, as producing all the new computers and servers required will have a non-negligible environmental impact

Case 2 : Ethical Speculation

Exercise:

1. Read the scenario. You can deepen your understanding by reading the associated article.
2. **Part I:** the dark and pessimistic story of your Escape the Mirror scenario
 - a. Brainstorm and invent a character that would be negatively impacted by the software. What would happen to them?
 - b. Write a pitch that summarizes the story and find an attractive title.
 - c. Fill out the template below with the details of your story
3. **Part II:** the happy ending of your Escape the Mirror scenario
 - a. Identify the ethical issues in your scenario (1 or 2 is sufficient)
 - b. What would be the immediate and long term consequences?
 - c. Brainstorm a happy ending story for your character: how could the harms be avoided? What kinds of solutions could help address the harms?
 - d. Fill out the template below with your answers

Scenarios:

Scenario A: personalized medicine

Source article: [The Crucial Role Of Predictive Analytics In Precision Medicine](#) (Forbes)

One technological advancement that holds tremendous promise for the future of healthcare is predictive analytics. By analyzing large amounts of data from various sources, predictive analytics can identify patterns and trends that can inform the development of targeted interventions and programs and help healthcare providers make more informed decisions about patient care. Additionally, the technology can help physicians develop personalized treatment plans for individual patients, which can help to improve outcomes and reduce healthcare costs.

For example, by analyzing an individual's genetic data, healthcare providers can identify which medications are most likely to be effective for that patient and which may cause side effects. By

analyzing an individual's lifestyle and environmental data, physicians can identify risk factors and make recommendations for lifestyle changes that can help to prevent the development of certain conditions or diseases.

Predictive analytics can revolutionize healthcare but faces many challenges. A holistic approach is needed, involving data preparation, model selection, privacy, security, and fairness. Healthcare data's complexity requires ongoing monitoring and adaptation. Despite challenges, predictive analytics offers great promise for improving healthcare with meaningful insights.

Scenario B: dating apps

Source article: [The Tinder algorithm, explained - Vox](#)

In the past, Tinder employed a hidden rating system, akin to Elo ratings, which gauged desirability based on how many users liked your profile. The weight of a swipe depended on the swiper's own desirability, creating a hierarchy. In 2019, Tinder introduced an upgraded algorithm, shrouded in secrecy but seemingly based on user behavior patterns and preferences, minimizing the competitive aspect.

Other dating apps, like Hinge and The League, utilize distinct algorithms. Hinge claims to employ machine learning to predict compatibility, while The League prioritizes profiles matching popular preferences, even considering LinkedIn connections.

A 2012 study from Northwestern University argued that algorithms struggle to forecast relationship success before people interact, emphasizing the importance of real-world chemistry. Helen Fisher, a researcher at Match.com, echoed this sentiment, asserting that cognitive overload hinders our ability to choose from a multitude of options. She suggested limiting choices to nine matches, our brain's optimal capacity.

In essence, dating apps employ diverse algorithms to facilitate connections, but their effectiveness remains uncertain. Genuine compatibility often emerges through actual interactions, and cognitive limitations play a substantial role in the online dating landscape.

Proposed options:
Scenario A : Personalized Medicine



Healthy yours

In a future where healthcare costs are skyrocketing, a predictive analytics system initially designed to assist doctors becomes accessible to everyone, bypassing the need for costly doctor visits. Emma, a middle-class worker struggling with healthcare expenses, turns to this system for all her medical needs. Initially, the system is a lifesaver, offering personalized treatment plans and medication without expensive consultations. However, Emma begins to rely heavily on the system, which prescribes a highly addictive medication without adequate risk warnings. As Emma's dependency on the drug grows, her health deteriorates, and she avoids seeing real doctors due to the convenience and lower cost of the automated system.



Healthy yours

Ethical issues: unsafe software + unfairness for people who cannot afford access for quality healthcare

Immediate consequence :

Unsafe medicine prescription: Due to overreliance on the system without human oversight, there is a risk of misdiagnosis and incorrect medication prescriptions. Such errors can significantly impact a patient's life, even in the short term, leading to adverse health outcomes. Repeated misdiagnoses, omissions, or incorrect prescriptions can cause the patient's health to deteriorate rapidly, highlighting the critical need for human intervention in medical decision-making.

Future consequence :

Increase of social inequality: due to lack of funds, lower and middle-income individuals are more likely to use the system for healthcare, while the wealthy can afford to see doctors and continue to receive comprehensive medical care from doctors. While, the disadvantaged may face limitations and risks by relying solely on AI systems.

Happy ending

In response to growing concerns, new regulations mandate that predictive analytics systems include mandatory human oversight by doctors. The system is updated to provide detailed risk information about medication and a doctor is required to approve prescriptions in the system workflow. The company developing the software also puts in place a special program for disadvantaged patients in partnership with non-profit organizations. Patients who match corresponding socio-economic criteria are offered some free consultations based on their health status. Emma benefits from this new feature and she receives help for managing her dependency and a new treatment to regain her health.

Scenario B : Dating apps



EchoSoul

EchoSoul, an IA-powered dating app, is a worldwide leader on the dating market. Their app collects a wide range of data from both users' phones and the internet to feed to a hidden desirability rating system. Emma, seeking companionship, initially benefits from the app's personalized matches. In 2030, EchoSoul launches a new version of their software for matching employees with companies. They are hugely successful and revolutionize recruitment around the world. When Emma loses her job as a structural engineer at Implenia she naturally turns to EchoSoul for finding her new dream position. But Emma's profile does not seem to match the companies she is attracted to and the app shows her jobs in other domains. None of her attempts to apply to structural engineering companies succeed, as EchoSoul suggests to recruiters she is not a good match. She starts to feel inadequate, isolated and distress kicks in.



EchoSoul

Ethical issues: data privacy issues + empowerment issues

Immediate consequence :

Data privacy issues: Because of the wide range of data collected, EchoSoul can infer a range of private information about its users such as their day to day habits, their personality traits and their political orientations. Users might not realize the breach to their privacy. In addition, data leaks (accidental or through attacks) could have disastrous consequences.

Future consequence :

Empowerment issues: Users of the software don't know on which basis they are a match or not. In addition, they don't have any control on how the software "sees" them. In situations where the software acts as a gatekeeper for access to life-supporting conditions such as employment, this can result in a complete disempowerment of individuals. This can lead to severe emotional harm and effects on mental health.

Happy ending

Swiss citizens concerned with their data privacy filed a complaint regarding EchoSoul to the Swiss data protection authority. Other European countries followed and EchoSoul was imposed significant fines for data privacy issues. As a result, Emma was able to request the deletion of her data, which reinitialized her ranking in the app. She then started to see improved results in terms of matching for her job search. She has now found her dream job and has regained better mental health.

Later, in an effort to empower their users, the developers of EcoSoul introduced a new feature allowing users to select the attributes taken into account in the ranking algorithm.

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