UNIVERSITÄT DES SAARLANDES

DIATRACK

Track your sugar

A Personal and Agile Journey

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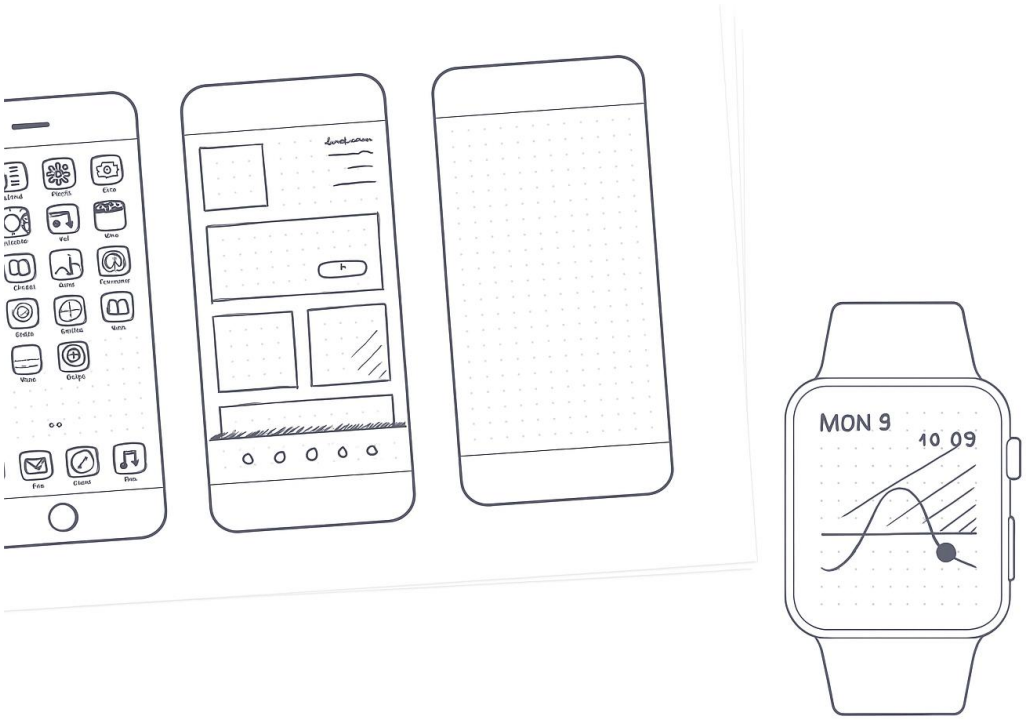
1. Introduction

My journey toward creating DiaTrack began with witnessing my father's daily struggle with diabetes management. Doctors described his blood sugar as "uncontrollable," leading to frequent clinic visits and painful finger-prick tests. These experiences significantly affected our family's life, motivating me to seek a better, pain-free solution.

DiaTrack was conceptualized as a hybrid system—a wearable glucose monitoring device coupled with a software-as-a-service (SaaS) analytics platform, developed using methodologies taught in the "Prototyping and Agile Project Management" course.



2. Phases and States of Prototype Development

DiaTrack's development went through clearly defined phases and states, strictly following methodologies from the course.

Initial Conceptualization

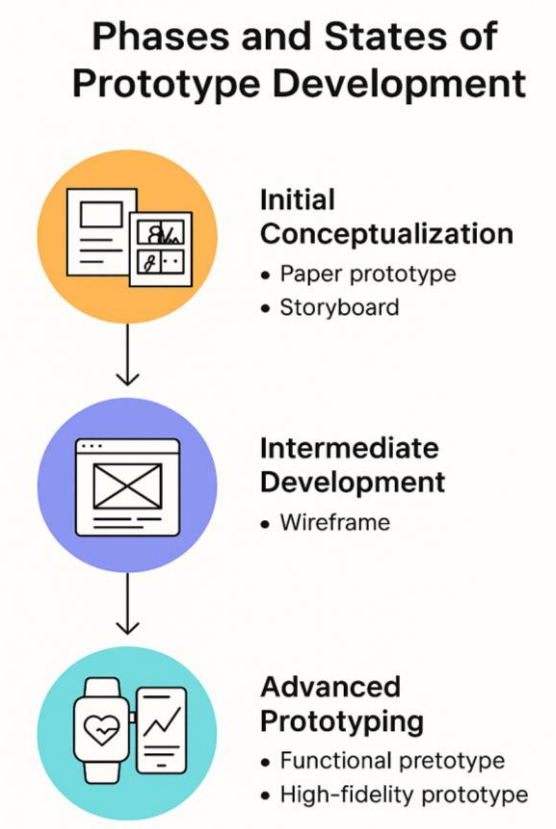
- Paper Prototype: Simple sketches visualizing basic product concepts and functionalities.
- Storyboard: Illustrations depicting user interactions with DiaTrack in daily scenarios.

Intermediate Development

- Wireframe: Basic digital sketches of app interfaces emphasizing usability and flow.

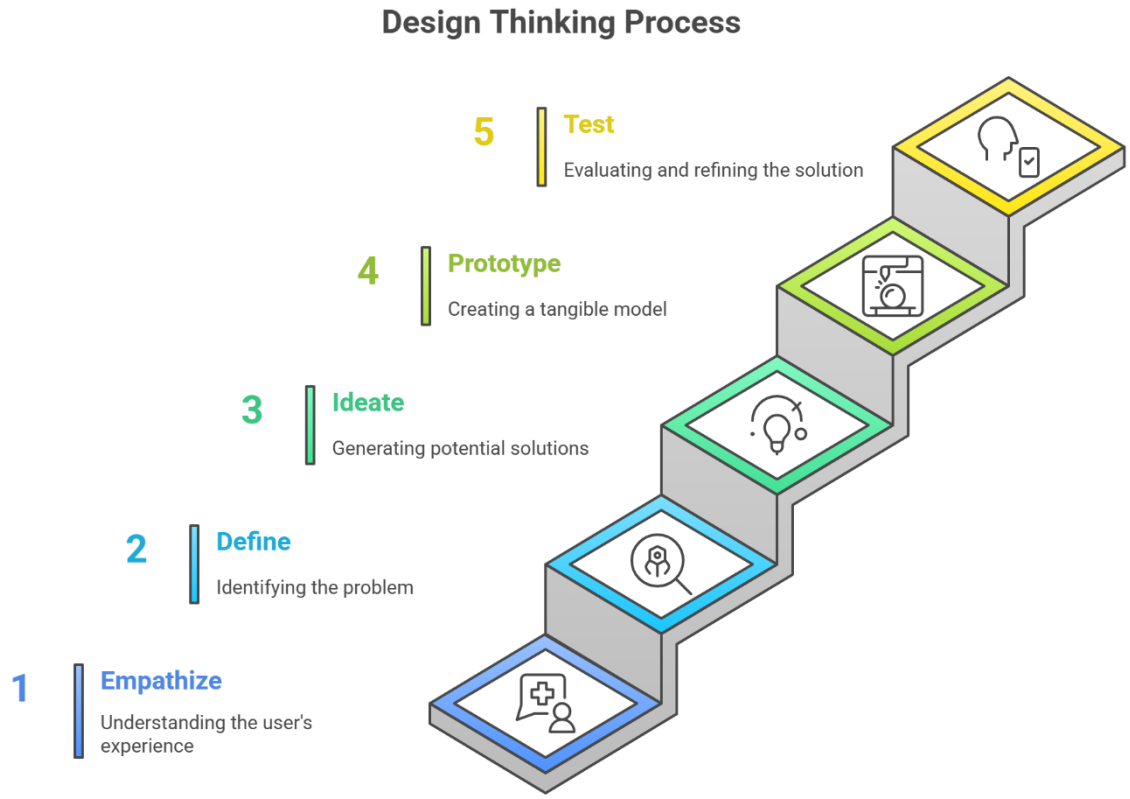
Advanced Prototyping

- Functional Pretotype: Quick, low-cost models designed to gather user feedback on core concepts and usability.
- High-Fidelity Prototype: Functional MVPs developed and tested under realistic conditions.



3. Creative Development – Design Thinking

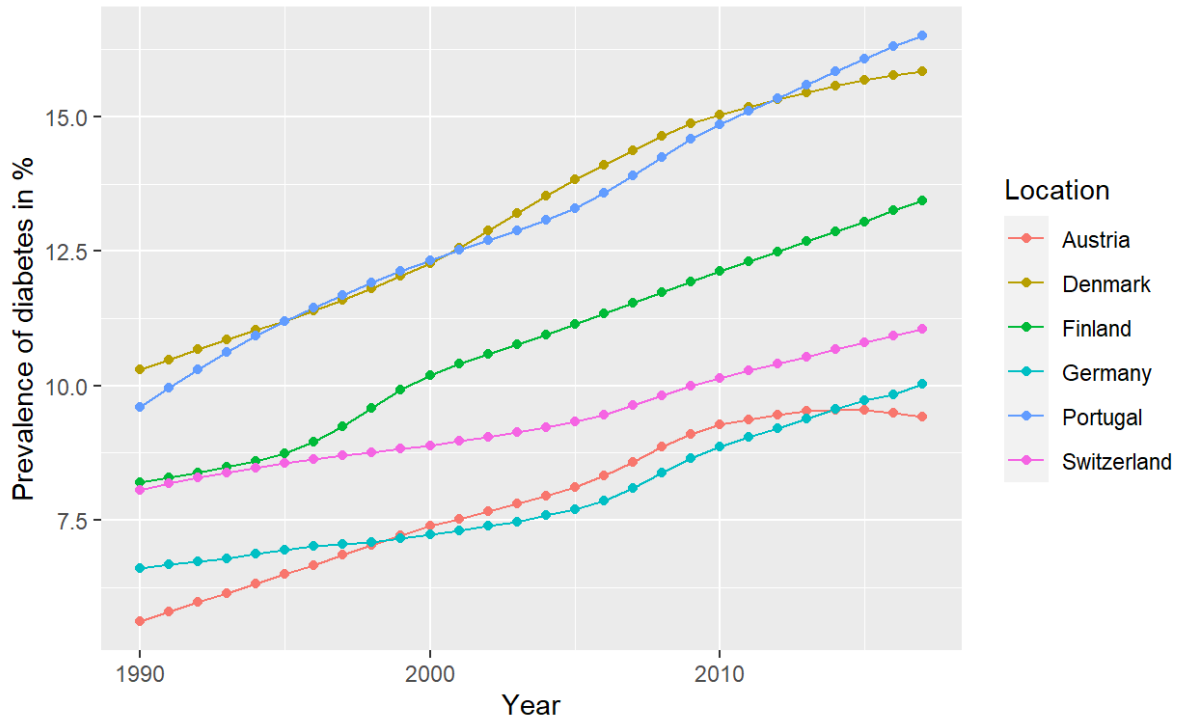
The creative process closely followed the 5-stage Design Thinking model from the course.



Empathize

- My father's personal struggle with diabetes led to extensive user research, including interviews with diabetics and healthcare providers.
- Conducted analysis confirming diabetes as a significant and growing healthcare challenge in Europe.

In the next page you will see the trend of prevalence of diabetes in six European countries, 1990-2017.



Source: Mihiretu Kebede (PhD. (2020, July 25). *Aspire Data Solutions: Visualizing the prevalence of diabetes in six European countries, 1990-2017*. Aspire Data Solutions. https://www.mihiretukebede.com/posts/2020-07-25-2020-07-25-diabetesprevalenceeurope/

Define

- Clearly articulated problem statement: "Patients with diabetes need a painless, continuous glucose monitoring solution that provides real-time, actionable insights."

Ideate

- Extensive brainstorming and innovative ideation sessions, exploring alternative glucose monitoring technologies, ultimately leading to the photothermal detection concept.

Prototype

- Iterative prototyping, from paper sketches to functional MVPs.

Test

- We conducted comprehensive user acceptance testing (UAT) with real users, systematically gathered detailed feedback, identified usability issues, and refined DiaTrack through iterative retesting cycles. This Agile approach helped in ensuring it consistently meets real user needs and remains functionally robust.

4. Project Management – Scrum Application

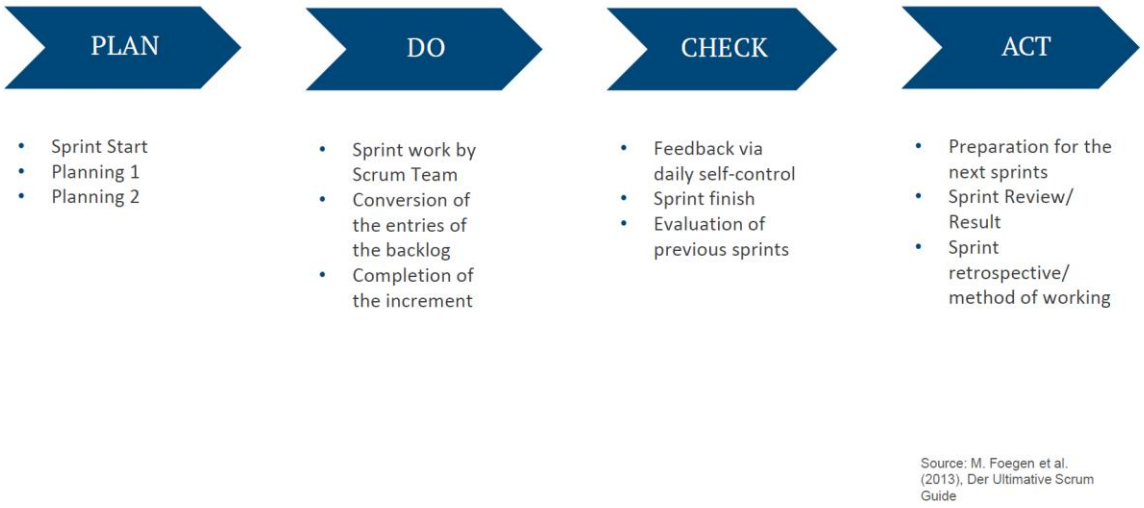
Implemented Scrum principles to manage the development effectively.

Scrum Roles

- **Product Owner:** I assumed this role so as to represent the user perspective, drawing heavily from my father's experience and interview data. I was responsible for defining and prioritizing features that made the app and device useful in real, everyday settings.
- **Scrum Master**: A teammate with experience in agile facilitation helped the team stay aligned with the framework and the deliverable timelines, ensure stand-ups were consistent, and remove day-to-day blockers.
- **Development Team**: A small, cross-functional team that included a biomedical specialist, a hardware systems engineer, a designer on both the software and hardware levels, a full-stack developer, and an architect or a product manager. Their collaboration ensured that both the device and the app evolved in tandem. Each team member brought domain-specific knowledge—ranging from sensor calibration to intuitive visualization design—executing each sprint with autonomy and a clear focus on user goals.
- **Consultants and External Experts**: We also actively collaborated with academic and clinical partners for expert insights and validation. The Biomedical Engineering department at Saarland University offered guidance on sensor technologies, while University Hospital Homburg supported initial concept validation and usability testing with practitioners. These partners enriched our understanding of medical workflows and patient needs, ensuring DiaTrack aligned with real-world clinical expectations.

Scrum Artefacts and Events

- **Product Backlog**: We built this based on Design Thinking outputs. For instance, after users mentioned difficulty interpreting graphs, we created a backlog item: "simplify blood sugar visualisations."
- **Sprint Planning**: We divided development into two-week sprints. An example sprint included integrating Bluetooth data transmission and testing it with two diabetic patients.
- **Sprint Reviews and Retrospectives**: At the end of each sprint, we demoed working features with at least one real user (e.g., my father or a clinic partner). This direct feedback was then reviewed in retrospectives, where we assessed what to keep, drop, or rethink.

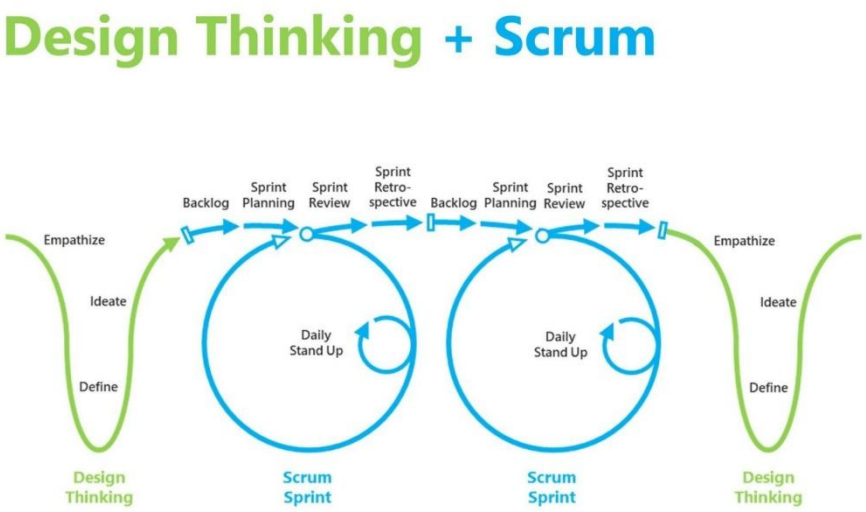


5. Integrating Scrum and Design Thinking

For DiaTrack, Design Thinking served as the compass, i.e., guiding us toward what truly mattered to users. Insights from interviews and early testing, especially regarding device comfort and data visibility, directly informed our product backlog. For example, the emotional discomfort around traditional glucometers led to prioritizing a skin-friendly patch prototype and an alert-driven app UI.

On the other hand, Scrum acts as the steering wheel to our project, where it ensures our progress remains focused and incremental. Each sprint roots back to a design thinking insight, and that allowed us to make rapid changes based on real feedback. This dual approach helped us stay grounded in empathy while pushing features like Bluetooth syncing, alert notifications, and battery-saving firmware updates. Further updates also include an analysis platform leveraging machine learning algorithms with an AI agent to suggest probable solutions.

The integration is not always smooth: as design thinking embraced ambiguity and exploration, Scrum demanded specificity and commitment. But by bridging the two, starting sprints only after clarity from empathy work, we created a feedback loop that remained both human and productive while bringing value to the real stakeholders, i.e., the customers.



6. Agile Prototyping – Evolution and Reasons for Change

From rough sketches to high-fidelity working units, DiaTrack's prototypes underwent major transformations at each sprint.

- The paper prototype (Sprint 1) revealed that users struggled to understand the feedback loop of the app.
- In Sprint 2, we introduced a clickable wireframe for the mobile UI and a foam wearable model. The feedback showed the model was too bulky. Hence, we had to act accordingly.
- By Sprint 4, we had a functioning PCB that could transmit dummy data via Bluetooth, tested directly with two patient volunteers.

Most of these changes were driven by user discomfort, such as skin irritation, rashes, or confusion with data trends. Technical feasibility also nudged us to switch from optical components to photothermal ones. Additionally, a conversation with the biomedical team led us to introduce safer shielding and adjust the charging unit for patient safety.

Each prototype taught us something new about the product and what users valued.

7. Strengths, Pitfalls, and Solutions

Strengths

- DiaTrack kept real users, like my father, at the heart of every decision. This human focus meant that even early sketches solved actual daily problems by making the targets simpler to achieve.
- We saved time and effort by not over-investing in wrong ideas and focusing on our core idea. Agile prototyping let us discard bad design choices after one sprint, thereby helping us save valuable time and resources.
- Multi-disciplinary collaboration. Having a team that included biomedical, hardware, software, and design expertise meant issues could be tackled holistically from different angles within the same sprint

Pitfalls and Solutions

- **Ambiguous Backlogs**. In the first few sprints, some backlog items were too vague—like "improve readability." We learned to convert these into testable outcomes, e.g., "Font size must be readable for people at or above 60 years old at arm's length."
- **Over-iteration**. Feedback is gold, but not all suggestions fit the scope. We sometimes tried to address every point, which slowed progress. This taught us to stay focused on our core idea and the development by validating patterns in feedback before committing.
- **Team Sync Issues**. Hardware and software teams sometimes moved at different paces. Retrospectives helped us realign priorities by visualizing blockers.
- **Regulatory Blind Spots**. Initially, we overlooked MDR (Medical Device Regulation) compliance milestones. Thanks to early consultations with our university and the Saarland University Hospital, we incorporated the documentation from Sprint 5 onward.
- **Hardware Supply Delays:** At one point, a specific sensor component we had spec'd for testing was unavailable due to supply chain disruptions. We addressed this by rapidly evaluating and approving an alternative component with similar calibration behaviour, then documenting the decision transparently to avoid future inconsistencies.

8. Conclusion

Bringing DiaTrack to life has been less of a straight-line build and more of a constantly looping learning curve. What began as a solution to a deeply personal problem evolved into a layered and collaborative effort rooted in human needs and systematic development.

Each stage, from sketching interfaces on paper to testing live circuits with users, served not only the product but also the team behind it. We did not apply Design Thinking and Scrum for the sake of academic correctness. We used them because they worked. Because they made us pause, reflect, and iterate—not on assumptions, but on real conversations with the people we wanted to help.

This project reinforced that building technology in healthcare isn't about novelty. It's about precision, empathy, and persistence. DiaTrack is far from the final word—but it’s a strong beginning, guided by the right questions and kept agile by design.

From my father’s frustration to a functioning wearable, this project proved that technology becomes meaningful only when anchored in empathy and built through humble iteration.