Prioritizing user needs in diabetes care

Master Thesis

Author:

Nicoleta Diana Radu

MASTER-PROJECT

NICOLETA DIANA RADU

ENGINEERING PSYCHOLOGY

AALBORG UNIVERSITY

JUNE 4, 2025

ECTS:

30 ECTS

Semester:

10. semester

Semester theme:

Master Thesis

Project period:

1 february 2025 - 30 June 2025

Author:

Nicoleta Diana Radu

Supervisor:

Dorte Hammershøi

Total pages: 90

Abstract:

Abstract

Despite advancements in insulin delivery technologies, people living with diabetes continue to face a wide range of unmet needs, including practical challenges, emotional strain and disruptions to daily life. This project, developed in collaboration with Novo Nordisk, uses a user-centered approach to explore these needs, identify key challenges, and prioritize them based on their perceived value.

Through deductive thematic analysis of three qualitative studies, supported by the *Value Proposition Design* framework and a stakeholder workshop with Novo Nordisk, 10 value propositions were identified.

To prioritize these propositions, a pairwise comparison study was conducted with 395 participants across four countries. The results were analyzed using the Bradley–Terry–Luce (BTL) and Elimination-by-Aspects (EBA) models. While the BTL model ranked *"I trust that my diabetes treatment is safe and reliable"* as the most important value proposition, the EBA model identified *Treatment Confidence* as the most valued aspect and *Physical Comfort* as the least. Overall, the EBA model provided a significantly better fit.

Preface

Living with diabetes involves not only medical routines but also emotional, social, and practical challenges that shape daily life. While advancements in insulin delivery have made treatment more efficient, many people still face barriers that impact adherence, comfort, and overall well-being. This project was developed in response to those unmet needs, with a focus on understanding how individuals experience and navigate insulin therapy through the lens of their everyday lives.

Conducted in collaboration with Novo Nordisk, the project takes a user-centered approach to explore the experiences of people living with diabetes and translate those insights into actionable value propositions. Rather than relying solely on technical performance or assumed priorities, this work aims to surface what the users value most.

The project draws from three qualitative studies provided by Novo Nordisk, using thematic analysis to identify key user needs. These needs were reformulated into first-person value propositions, then prioritized through quantitative comparison involving participants from four countries. The goal was not only to describe challenges but also to help guide innovation in a direction that is both evidence-based and human-centered.

This report is structured to follow the process: from understanding the problem space and theoretical grounding, through methodology and analysis, to the final prioritized value propositions.

Acknowledgments

Contents

Introduction 1

Novo Nordisk, headquartered in Denmark, is among the global leaders in diabetes care, known especially for pioneering advancements in insulin delivery devices such as insulin pens. These devices have revolutionized diabetes management by simplifying insulin injections, improving dosing accuracy, and enhancing patient convenience and independence [Luijf and DeVries, 2010] [Spollett, 2010] . Insulin pens have progressively become the preferred delivery method among patients globally, recognized for their ease of use, portability, and precise insulin administration capabilities [Anderson and Redondo, 2011][Asamoah, 2008].

However, despite the continuous innovations in insulin pen technologies, research consistently highlights ongoing challenges that insulin pen users face. These challenges can be broadly categorized into physical usability issues and psychosocial barriers. Usability studies reveal that physical concerns such as injection-related pain, discomfort, dosing inaccuracies, and challenges related to device handling remain prevalent [Tommasi and Silvestri, 2024][Sparre et al., 2023][Goldman et al., 2023]. Such issues are especially pronounced among patient groups with motor impairments, reduced dexterity due to arthritis, or those suffering visual impairments who struggle with precise dosage settings [Scott, 1999][Williams and Schnarrenberger, 2010].

Complementing these physical challenges, large-scale studies such as the Diabetes Attitudes, Wishes, and Needs (DAWN and DAWN2) highlight significant psychosocial barriers impacting insulin pen users [Nicolucci et al., 2013]. These include emotional distress associated with daily insulin management, stigma when injecting insulin in public settings, and disruptions to lifestyle routines that ultimately affect patient confidence, self-efficacy, and quality of life. The complexity of these psychosocial factors often leads to inconsistent treatment routines and suboptimal diabetes control [Nicolucci et al., 2013]. While numerous studies have documented these unmet needs, there is currently a gap in systematically prioritizing these issues from a user-centered perspective. Existing literature typically outlines and describes the unmet needs qualitatively or quantitatively, yet rarely provides structured guidance on which unmet needs should be addressed first to achieve the greatest impact on patient well-being and treatment experience [Lamaro et al., 2024][Bonet-Olivencia et al., 2023][Alsayed et al., 2024][Raposo et al., 2021]. Thus, despite extensive knowledge of usability and psychosocial barriers, product development efforts may not always align optimally with patient priorities, potentially leading to missed opportunities for meaningful innovation.

In collaboration with Novo Nordisk, this project seeks to bridge this gap by categorizing and prioritizing the unmet needs of people living with diabetes, using internal company data. By doing so, this study intends to inform targeted product improvements that align closely with user needs, ultimately enhancing user satisfaction, adherence to treatment, and overall quality

of life.

1.1 Problem Analysis

This section explores the key challenges faced by people living with diabetes, focusing on two main areas: physical usability issues and psychosocial barriers. These challenges impact individuals' ability and motivation to adhere to insulin therapy, which in turn influences treatment outcomes. In addition, the section reviews existing research on these topics, highlighting gaps in how unmet needs have been identified and prioritized.

Physical Usability Challenges

Insulin pens have been widely adopted due to their ease of use, convenience, improved dosing accuracy, greater confidence in administering insulin correctly, and higher perceived social acceptance compared to traditional vial and syringe methods [Anderson and Redondo, 2011]. For example, a study comparing the handling and accuracy of insulin administration found that FlexPen, a prefilled insulin pen developed by Novo Nordisk to enhance ease of use and dosing precision, was preferred over other methods [Asakura et al., 2009]. The choice of injection device plays an important role in the treatment and management of diabetes, as illustrated in Figure 1.1 and discussed by Sparre et al. While the type and dosage of insulin are central to therapy, the design of the delivery device itself has a significant impact on usability, treatment adherence, and the overall experience of people living with diabetes [Sparre et al., 2023].
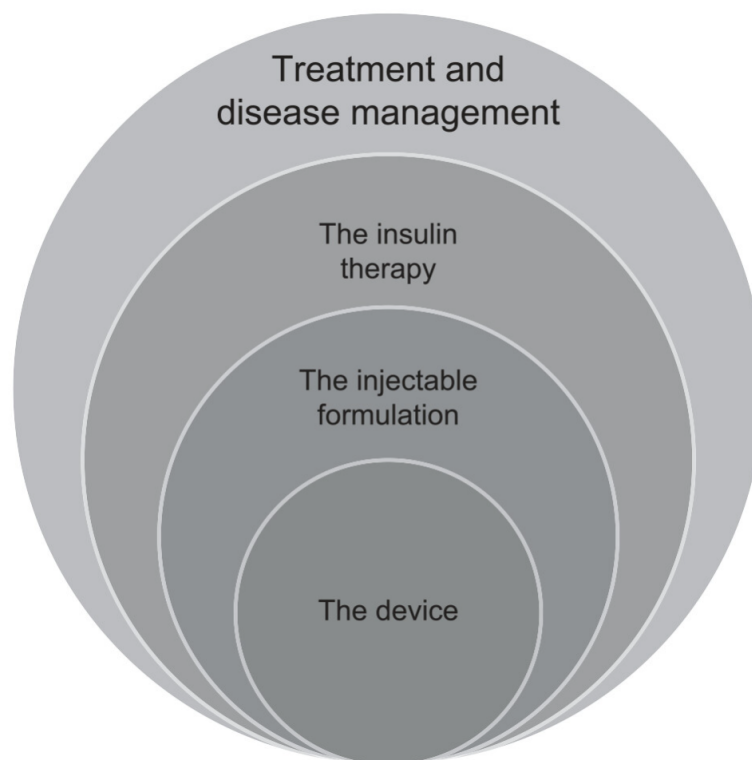

Figure 1.1. . The insulin injection device plays an important role in the success of diabetes management [Sparre et al., 2023]

However, despite continuous advancements, patients still encounter usability issues that can compromise treatment adherence and glycemic control. These challenges include pain and discomfort during injections, difficulties in handling the device due to dexterity limitations, dosing inaccuracies, and general usability concerns. [Tommasi and Silvestri, 2024][Sparre et al., 2023][Goldman et al., 2023].

Research consistently highlights four primary categories of usability-related challenges: pain, dexterity issues, dosing inaccuracies, and handling difficulties. These categories are well-supported in the literature and underscore the importance of device design in effective diabetes management:

- **Pain:** Factors such as needle design, including length and diameter, significantly influence the pain experienced during insulin administration. Shorter and thinner needles have been associated with reduced pain perception. Additionally, the number of bevels on a needle tip can impact penetration force and patient comfort, with five bevel needles showing improved outcomes over three bevel designs. The number of bevels on a needle tip refers to the number of angled cuts at the tip of the needle that influence sharpness, penetration force, and patient comfort during an injection [Præstmark et al., 2016] [Ponsiglione et al., 2023]

- **Dexterity Problems:** Patients with limited manual dexterity, particularly those with conditions such as arthritis or diabetic neuropathy, often face significant challenges when using insulin pens. Reduced grip strength, impaired fine motor control, and difficulties applying the necessary injection force can hinder proper insulin administration, leading to potential dosing errors and reduced adherence to treatment. Research indicates that both Type 1 and Type 2 diabetes patients frequently experience dexterity impairments, which can make handling insulin devices more difficult and necessitate design adaptations to accommodate their needs [Pfützner et al., 2011] Usability studies highlight that patients with dexterity limitations benefit from insulin pen designs that minimize manual effort and simplify the injection process. For example, novel needle attachment mechanisms requiring less force and fewer handling steps have been shown to improve ease of use [Hansen et al., 2011]. Similarly, human-centered design approaches emphasize the need for insulin pens that account for dexterity impairments, ensuring that users can reliably set and administer their insulin dose without difficulty [Watterson et al., 2022]

- **Dosing inaccuracies:** Dosing inaccuracies in insulin administration can significantly impact glycemic control and patient safety. Several factors contribute to these inaccuracies:

  1. *Dose Increment Size:* The granularity of dose adjustments plays an important role in achieving precise insulin dosing. Insulin pens that allow for smaller dose increments, such as half-unit adjustments, enable more accurate dosing, particularly beneficial for patients requiring fine tuned insulin therapy. A study assessing a prefilled, rapid-acting insulin pen capable of half-unit increments demonstrated high dose accuracy, underscoring the importance of such features in insulin delivery devices [Kappes et al., 2017]

  2. *Feedback Mechanisms:* Effective feedback during dose setting and administration is important to prevent dosing errors. Insulin pens equipped with clear, audible, or tactile feedback mechanisms can enhance user confidence and accuracy. For instance,

devices that provide an audible click for each dosage increment help reduce the risk of dose measurement errors, thereby improving dosing accuracy [Asakura and Seino, 2005]

3. *Priming Errors:* Proper priming of insulin pens is essential to ensure accurate dosing by removing air bubbles and ensuring the pen functions correctly. However, studies have shown that a significant number of patients are unaware of the importance of priming, often skipping this step, which can lead to inaccurate dosing and compromised glycemic control [Cross, 2018][Truong et al., 2017]

- **Handling Difficulties:** Handling difficulties with insulin pens, such as size, weight, and dose display clarity, can significantly impact usability, especially for patients with reduced strength or visual impairments. A study evaluating the impact of human factors and pen needle design on insulin pen injection found that design elements, including the physical ergonomics of the pen, can influence injection depth accuracy and consistency. This underscores the importance of considering user strength and dexterity in pen design to ensure proper insulin administration [Rini et al., 2019]. Additionally, ergonomic analysis of insulin pens revealed that features such as trigger location and spring-assisted delivery systems can reduce the force required for administration. Pens with lateral triggers and ergonomic designs were found to require lower force for insulin delivery, enhancing usability for patients with limited hand strength [Fendler et al., 2015].

Psychosocial Barriers

Psychosocial barriers can influence the effective use of insulin pens among individuals with diabetes. These barriers encompass emotional distress, stigma and lifestyle disruptions, all of which can negatively affect treatment adherence and overall diabetes management. Addressing these factors is essential for ensuring that insulin therapy is both accessible and sustainable for patients.

- **Emotional distress:** Starting and continuing insulin therapy can trigger a range of difficult emotions, including fear, anxiety, and a sense of personal failure [Hendrieckx et al., 2021]. Some people view the need for insulin as a sign that their condition is getting worse or that they haven't managed their diabetes well, which can lead to feelings of guilt or hesitation to begin treatment [Hendrieckx et al., 2021]. A common psychological concern is the fear of injections, which can discourage patients from adhering to prescribed insulin regimens. In addition, anxiety about possible side effects, such as hypoglycemia or weight gain, can further contribute to emotional distress [Hendrieckx et al., 2021]. The DAWN2 study revealed that 14.8% of participants worldwide showed signs of depression, and 13.4% reported a poor quality of life [Hall and Kalra, 2014]. This emotional distress can interfere with self-management practices, including the consistent use of insulin pens

- **Stigma:** Many individuals experience stigma associated with insulin use, particularly when injections are required in public settings. Concerns about being judged, misunderstood, or seen as unhealthy can lead to embarrassment and avoidance behaviors [Hendrieckx et al., 2021].This discomfort can lead some individuals to delay or avoid taking insulin as prescribed, which may impair glycemic control and increase the risk of complications. Public or professional settings can increase feelings of vulnerability, as individuals may

worry about drawing attention or being negatively perceived [Hendrieckx et al., 2021]. The DAWN2 study highlighted that 19.2% of UK participants experienced high diabetes-related distress, with many attributing their distress to negative societal perceptions and stigma surrounding insulin use. [Hall and Kalra, 2014].

- **Lifestyle Disruptions:** Integrating insulin therapy into daily routines presents challenges that can disrupt both personal and professional activities. The need for regular injections can be perceived as inconvenient, especially in social situations, at work, or on vacation [Hendrieckx et al., 2021]. Some individuals feel burdened by the need to carry insulin pens and supplies or find it difficult to coordinate mealtimes with insulin administration. Concerns about insulin dependency can also play a role in lifestyle disturbances, as patients may worry about the long-term implications of insulin therapy on their independence. [Hendrieckx et al., 2021]. The DAWN2 study reported that 66. 9% of the participants worldwide felt a significant burden from diabetes treatment, underscoring the challenges in balancing therapy with daily life [Hall and Kalra, 2014].

Prioritizing Needs and Measuring Value

People living with diabetes face a range of challenges when using insulin pens, from practical usability issues to emotional and social barriers. To support better treatment experiences, it's important to understand which of these challenges matter most to users. This section looks at three existing frameworks: Service-Dominant Logic, Human-Centered Design, and Value Proposition Design, in order to explore how user needs can be organized and prioritized in a structured, patient-centered way.

The Need for Prioritization in Insulin Pen Usability

Managing diabetes requires daily interaction with treatment devices, and the usability of insulin pens plays a key role in supporting adherence and quality of life. However, the challenges people face can vary widely, making it difficult to determine which issues should be addressed first.

Previous research highlights two main approaches to prioritization in medical device design:

1. **Patient-Driven Prioritization:** Identifying which usability challenges cause the most burden based on patient-reported experiences [Hendrieckx et al., 2021].
2. **Value-Based Prioritization:** Assessing how solving specific issues contributes to better adherence, well-being, and clinical outcomes [Sparre et al., 2023].

Theoretical Perspectives on Prioritization and Value in Healthcare

Before exploring how unmet needs can be prioritized, it is helpful to look at existing frameworks that inform value creation and decision-making in healthcare. The following perspectives: Service-Dominant Logic, Human-Centered Design, and Value Proposition Design, offer complementary approaches for understanding and ranking user needs in a structured, patient-centered way.

Service-Dominant Logic (SDL)

Service-Dominant Logic (SDL) emphasizes that value is co-created through interactions between users and providers, rather than being embedded solely in the product itself [Vargo and Lusch, 2008; Edvardsson et al., 2011]. In diabetes care, this principle is reflected in initiatives like the *Diabetes Attitudes, Wishes, and Needs (DAWN & DAWN2)* studies, which focused on patient-defined needs and the psychosocial aspects of diabetes management. These large-scale studies involved patients, healthcare professionals, and policymakers to shape care strategies more holistically [Nicolucci et al., 2013].

Human-Centered Design (HCD)

Human-Centered Design (HCD) ensures that medical devices are tailored to patient needs, behaviors, and limitations rather than requiring users to adapt to the device [Göttgens and Oertelt-Prigione, 2021]. In insulin pen development, HCD has informed ergonomic improvements, visual accessibility enhancements, and simplified injection mechanisms. However, an essential aspect of HCD is not just identifying usability challenges but also prioritizing them based on user burden. This is done through iterative testing, user feedback, and real-world usability assessments, allowing researchers to determine which barriers should be addressed first to maximize patient adherence and comfort [Hansen et al., 2011; Sparre et al., 2023; Tommasi and Silvestri, 2024; Scott, 1999; Williams and Schnarrenberger, 2010].

Value Proposition Design (VPD)

Value Proposition Design (VPD) provides a structured framework for assessing which product features create the most value for users [Osterwalder et al., 2014]. This approach categorizes product attributes into the following:

- **User Pains:** The most frustrating aspects of using a product.
- **User Gains:** The benefits that make a product valuable.
- **Job-to-be-Done:** The fundamental need the product is designed to fulfill.

In diabetes technology, VPD has been widely applied in the development of digital health solutions that support insulin therapy. Research indicates that patients place high value on insulin delivery devices that minimize the burden of treatment and integrate seamlessly into daily routines. Features such as longer-lasting prefilled insulin pens, smart connectivity, and ergonomic designs have been introduced to enhance the perceived value of insulin pens by improving convenience and reducing pain perception [Giger et al., 2025].

1.2 Problem Statement

Despite advancements in insulin pen technology, significant physical and psychosocial barriers persist, impacting adherence and diabetes management. While these challenges are well-documented, structured approaches to ranking these challenges based on patient-reported burden remain limited. This study aims to systematically categorize and rank these unmet needs to inform product development efforts that enhance usability, adherence, and overall treatment outcomes.

Methods 2

The methodology used in this project is based on empirical data from Novo Nordisk's user research, consisting of three qualitative studies that explore the lived experiences of people managing diabetes. The following sections describe the data sources, analytical approach, and theme identification process.

2.1 Generative Design Research (First Study)

Generative Design Research (GDR) study was designed to explore real-world experiences, challenges, and perceptions of insulin pen users. Unlike traditional usability studies that focus on specific device functionalities, GDR aims to explore users' broader lived experiences. This method allows researchers to understand not only what users do but also why they do it, uncovering latent needs and behavioral patterns.

Data Collection Methods

The data used in this study was collected through multimodal qualitative research techniques. The primary data sources include:

1. **Self-Recorded Video Diaries**

   - 661 self-recorded videos captured by insulin pen users over a two-week period.
   - The first week focused on general aspects of daily life, while the second week specifically explored diabetes management behaviors.
   - Participants documented their struggles, routines, and emotional responses to insulin therapy.

2. **Remote Probe Exercises:** Participants were provided with structured reflection tasks to complete at home.

   - *Data recording habits:* How participants log and track their blood glucose levels.
   - *Challenges with diabetes self-care:* Situations where diabetes management became difficult.
   - c*Social and environmental factors:* How external circumstances such as work, family, or stigma influenced treatment adherence.

3. **Co-Design Future Scenarios:**

   - Researchers developed five potential future scenarios for insulin pen technology.
   - Participants engaged in evaluating, modifying, and expanding these concepts.
   - The co-design process aimed to validate pain points and explore innovation opportunities.

4. **Empathy & Analysis Workshop:** This session involved product developers, researchers, and industrial designers.

The findings from the Generative Design Research reveal five key areas that reflect the lived experiences, behaviors, and attitudes of people using insulin pens. These insights, based on users' self-reported challenges and reflections, help illustrate the broader context in which insulin therapy takes place.

Key Insights from the Generative Design Research:

1. **Challenges with Diabetes Management:** One of the key insights from the research was that blood glucose (BG) monitoring plays a central role in diabetes management. Users perceive BG readings as a measure of success or failure in controlling their diabetes, often leading to frustration and fear when readings are unexpected or difficult to interpret.

   - BG readings dictate treatment decisions: Users described their approach as similar to athletes monitoring performance metrics, as every reading prompts an evaluation of whether their diabetes management is working.
   - The insulin pen itself is not perceived as a major challenge: Most difficulties reported by users were related to understanding BG fluctuations, rather than insulin injection itself.
   - Delays in insulin administration are common but not perceived as non-adherence: Users postpone insulin injections rather than skipping them entirely, adjusting their treatment to fit their daily schedules.

2. **Data & Data Recording:** Users expressed difficulties in recording, interpreting, and acting on diabetes-related data. The study found that data collection is often done for healthcare professionals (HCPs) rather than for personal use.

   - Users find data overwhelming: Many report keeping detailed logs but feel they do not know how to act on the recorded information.
   - There is no single standardized method for data tracking: Some users hand write logs, others enter data manually into mobile apps, while some rely solely on BG meter readings.
   - Data sharing with HCPs is cumbersome: Users want effortless, seamless ways to share data, but currently, the process is fragmented and inconsistent.

3. **Hygiene:** The research revealed that hygiene is not a primary concern for insulin pen users, as current designs are perceived to be sufficiently clean and safe. The main hygiene concerns center around the needle rather than the pen itself.

   - Users generally trust the cleanliness of their pens: Many keep their devices in protective cases, ensuring they remain free from contamination.
   - Needle hygiene is a point of debate: Some users express concerns about reusing needles, while others follow the common behavior of changing them less frequently for convenience.
   - Durable and prefilled pens do not raise separate hygiene concerns: The perception of hygiene does not differ significantly between reusable and disposable pens.

4. **Durability:** Users generally do not perceive a difference in durability between prefilled and reusable pens, with environmental factors influencing preference more than perceived robustness.

- Users believe both plastic and metal pens will last as long as needed.
- Environmental factors influence preference for reusable pens, but sturdiness and aesthetics do not significantly impact decision making.

5. **Wastefulness:** Environmental concerns are increasingly influencing insulin pen preferences.

- Users express discomfort about disposing of entire pens instead of replacing cartridges.
- Some prefer cartridge-based pens due to their lower environmental impact.

2.2 Research of Glucagon-Like Peptide-1 (GLP-1) (Second Study)

Glucagon-Like Peptide-1 (GLP-1) is a hormone produced in the gut that helps control blood sugar levels. It works by increasing insulin release, reducing the amount of glucose made by the liver, slowing down digestion, and making people feel full. Because of these effects, GLP-1-based medications are used to treat type 2 diabetes and help with weight loss [Zheng et al., 2024] This research focuses on Type 2 diabetes (T2D) management, particularly for GLP-1 patients. It provides 7 insights based on user research with 10 GLP-1 patients in the US.

Key themes emerged from this research:

1. **The Disconnect Between Treatment Structures and Everyday Life:** Managing diabetes extends beyond taking medications. It involves constantly balancing medical guidelines with everyday life responsibilities and personal well-being. Patients report that structured diabetes management routines often conflict with real-world activities, making adherence challenging.

    - Diabetes guidelines emphasize strict BG monitoring, medication timing, and dietary restrictions, yet social, professional, and personal commitments often disrupt these plans.
    - Socializing, personal enjoyment, and daily routines often interfere with structured diabetes rules, such as glycated haemoglobin (HbA1c) goals. HbA1c is a biomarker used to measure long-term blood glucose levels in individuals with diabetes or prediabetes. It reflects the average blood glucose levels over the past 2–3 months [HbA, 2011].
    - Some patients skip or delay insulin injections or BG monitoring due to work demands, family obligations, or special events. Some patients feel frustrated when they have to choose between enjoying life and following strict diabetes rules.
    - Managing diabetes is not just about taking insulin but also requires adapting diet, exercise, sleep patterns, and stress management strategies. Patients report feeling overwhelmed by the constant effort required to maintain their diabetes routine.

2. **Blood Glucose (BG) Monitoring as a Source of Emotional Stress**: For many patients, monitoring blood glucose levels is emotionally draining rather than empowering. Instead of serving as an actionable tool for improving health, BG readings often reinforce feelings of failure when numbers fluctuate unexpectedly.

    - Patients perceive BG levels as a judgment of how well they are doing, rather than a tool for improving health. When BG levels are within range, patients feel successful.

When readings are high, they feel like they have failed, even if they followed medical advice.

- Many struggle with unexpected high or low BG readings, despite consistent efforts to follow dietary and medication guidelines. Patients often cannot identify why their BG levels fluctuate, leading to frustration, anxiety, and feelings of helplessness.
- Continuous disappointing BG readings can lead to stress, burnout, and avoidance behaviors. Some patients skip monitoring their BG levels altogether to avoid negative emotional reactions.

3. **The Role of Social Support and Emotional Burdens:** Diabetes is often described as a lonely disease, with many patients reporting a lack of understanding from family, friends, and even healthcare professionals. Without support, maintaining consistent diabetes management becomes significantly harder.

- Many patients feel entirely responsible for their diabetes care, with little outside help. Some express frustration because others do not understand the daily challenges of managing the condition.
- Loved ones may offer misinformed advice, leading to tensions or resentment. For some individuals, family members dismiss their struggles, making them feel invalidated and unsupported.
- When immediate support is lacking, some patients turn to online communities, diabetes support groups, or distant acquaintances for guidance.
- Those who receive emotional or practical support from a spouse, close friend, or HCP find it easier to maintain treatment routines. Encouragement from a trusted person significantly improves adherence and motivation.

4. **The Psychological Impact of Not Reaching Goals:** When patients fail to meet their BG targets or HbA1c goals, the psychological impact can be profound, often leading to self-doubt, guilt, and avoidance behaviors.

- Patients feel guilty and self-critical when they struggle to maintain stable BG levels. Feelings of failure often lead to depression, stress eating, and lack of motivation.
- Some patients give up on monitoring or treatment adjustments, feeling that nothing they do will make a difference. In some cases, frustration causes patients to avoid medical appointments.
- Emotional distress increases cravings for comfort foods, making BG control even more difficult. A lack of structured emotional support leaves patients trapped in a cycle of self-blame and stress eating.

5. **The Need for Structured Transitions in Diabetes Management:** For many patients, the process of adapting to diabetes is overwhelming, particularly during the early stages of diagnosis.

- Patients must unlearn old behaviors and adopt new self-care routines. Without guidance, this transition feels disorganized and stressful.
- Many patients struggle in the early months after diagnosis or after a major medication change. Patients who lack structured transition plans often revert to previous unhealthy habits.
- When patients have a trusted HCP, they feel more confident navigating changes. A lack of continuity in care makes long-term adjustment harder.

6. **The Role of Self-Reflection and Goal-Setting:** Patients benefit from personal goal-setting, but external pressure does not drive motivation.

   - Patients who actively reflect on their habits are more engaged in diabetes management.
   - When patients set realistic, personal goals, they feel successful and in control. External pressure from HCPs or family can feel overwhelming.

7. **The Burden of Self-Management and the Need for Accountability:** Diabetes requires constant self-monitoring, which can feel overwhelming without external support or encouragement.

   - Patients feel they carry the entire burden of their treatment. Sharing goals with an HCP or family member improves engagement.

2.3 Living with Diabetes In India (Third Study)

The third study explores the Indian context of diabetes management, including cultural influences, access to healthcare care, stigma, financial barriers, and perceptions of treatment. The research gathered insights from people with diabetes (PwD) and healthcare professionals (HCP) from different regions of India.

Key themes extracted from the report

1. **Cultural and Religious Influences on Diabetes Management:** Diabetes care in India is heavily influenced by cultural traditions, religious practices, and family expectations. Food choices, fasting rituals, and home remedies impact diabetes management, sometimes conflicting with medical recommendations.

   - Traditional food habits influence diabetes control: Certain ethnic groups (e.g., Gujarati, Sindhi communities) have high-carb diets, making dietary modifications difficult. Rice consumption in South India is so ingrained in daily meals that HCPs struggle to convince patients to reduce intake.
   - Religious fasting complicates diabetes management: Festivals such as Diwali, Ramadan, and Karwa Chauth require fasting, often without water, which can severely impact blood glucose levels. Many PwDs consult doctors before fasting, but adherence to medical advice varies.
   - Strong belief in home remedies and alternative medicine: PwDs commonly consume bitter gourd juice, turmeric, neem juice, and fenugreek seeds, believing these can cure diabetes. Ayurveda and homeopathy treatments are widely practiced, and some patients prioritize these over medical treatments.
   - HCPs often tolerate alternative medicine use: While doctors do not promote these treatments, they avoid discouraging them outright, fearing patients might abandon medical treatment. Some PwDs attribute blood sugar stabilization to home remedies, leading them to discontinue insulin or prescribed medication.

2. **Gender Roles and Family Responsibilities in Diabetes Care:** In India, traditional gender roles influence who takes responsibility for diabetes management. Women often act as primary caregivers, while men receive family support in managing their diabetes.

- Wives, daughters, or mothers take charge of managing diabetes for male family members. They ensure dietary compliance, medication schedules, and medical appointments.
- If a woman has diabetes, she is often expected to manage it independently, without disrupting household responsibilities. Household duties take priority over self-care, leading to poor adherence to dietary and exercise recommendations.
- Impact of COVID-19 on sedentary lifestyles, especially among women: Many women became more housebound due to the pandemic, leading to reduced physical activity. Social isolation and boredom have increased diabetes-related distress among women.

3. **Social Stigma and Hidden Diabetes:** Diabetes is often stigmatized in India, leading many patients to hide their condition to avoid judgment or social consequences.

- Young PwDs fear that having diabetes will reduce their marriage prospects. Families avoid disclosing diabetes diagnoses when arranging marriages.
- Many PwDs refuse to inject insulin in public or check blood sugar levels openly. Finding a private space for injections at work or while traveling is a major challenge.
- PwDs hide their condition from colleagues and extended family to avoid unwanted attention and advice. HCPs note that stigma prevents some PwDs from seeking timely treatment.

4. **Limited Understanding of Diabetes and Late Diagnosis:** Many Indian PwDs have low awareness of diabetes complications and lack a clear understanding of its causes. As a result, most diagnoses occur late, often when symptoms become severe.

- Many PwDs believe eating sweets is the sole cause of diabetes. Other risk factors, such as sedentary lifestyles, genetics, and stress, are poorly understood.
- Many PwDs are diagnosed only after experiencing severe symptoms such as giddiness, excessive thirst, or extreme fatigue. Some T2D patients are hospitalized upon diagnosis due to dangerously high blood glucose levels.
- Many T1D patients have seen family members with diabetes and understand the disease better. T2D patients, especially in rural areas, are often unaware of potential complications.

5. **Financial Barriers to Diabetes Management:** Diabetes is a major financial burden for many PwDs in India, affecting access to medication, testing, and consultations.

- Diabetes treatment is an out-of-pocket expense for most patients: Health insurance rarely covers diabetes related expenses.
- Many PwDs switch to cheaper treatment options due to cost concerns: Some patients switch from insulin pens to vials and syringes to save money. Glucometers and test strips are often purchased sparingly, leading to infrequent BG monitoring.
- Many PwDs visit family doctors instead of specialists to avoid high consultation fees. HCPs are reluctant to prescribe expensive treatments, fearing that patients will seek cheaper alternatives elsewhere.

6. **The Psychological Burden of Diabetes and Self-Management Stress:** Diabetes requires constant self-monitoring, which many PwDs find mentally exhausting.

- Diabetes is perceived as an unavoidable burden: Many PwDs feel that diabetes has taken over their lives, making them constantly aware of their condition. The need for lifelong treatment is psychologically overwhelming.

- Fatigue and stress are common barriers to treatment adherence: PwDs struggle with energy levels, particularly in the afternoons. Diabetes-related stress and fatigue make it harder to stay motivated.

7. **Perception of Pen Injectors in Diabetes Management:**

- PwDs generally perceive insulin pen injectors as more convenient, discrete, and easier to use compared to vials and syringes.
- Many PwDs find pens less painful due to the shorter needle, leading to better adherence.
- Some PwDs still resist switching to insulin pens due to cost concerns, preferring cheaper alternatives like vials and syringes.
- Trust in HCP recommendations plays a key role in adopting insulin pens.

8. **Challenges with Pen Usage and Administration:**

- Some PwDs worry about injecting the wrong dose, missing doses, or unknowingly using an empty cartridge.
- HCPs express concerns about incorrect administration, especially among patients with low literacy or limited healthcare access.
- The need for better patient education on proper insulin pen use, including dose adjustment and injection technique.

9. **Durability and Practicality of Insulin Pens:**

- While PwDs appreciate the durability of reusable insulin pens, they also worry about potential breakage or malfunctions.
- Many PwDs expect reassurance from HCPs about the robustness of pens, especially in harsh climate conditions.
- The ability to transport insulin pens safely and maintain temperature control is a significant concern.

10. **Economic Constraints Affecting Pen Adoption:**

- Insulin pens are perceived as more expensive in the long run, despite their convenience.
- Some PwDs switch back to syringes due to affordability, despite preferring pens.

11. **Need for Improved Training and Instructions:**

- HCPs demand detailed training and instructional materials from manufacturers before confidently recommending insulin pens.
- QR codes on packaging, video demonstrations, and step-by-step guides are suggested to improve user confidence. Some PwDs prefer live demonstrations or in-person training sessions by nurses or diabetes educators.

12. **DuraTouch Feedback and Design Perception:**

- PwDs find the DuraTouch insulin pen visually appealing, with an easy-to-use design and a smooth dose adjustment mechanism.
- The short needle is perceived as an advantage, reducing pain and making injections more tolerable.
- HCPs raise concerns about ensuring the pen signals when it is running low or empty.
- PwDs rely on HCPs' reassurance for product adoption, highlighting the importance of strong medical endorsements.

2.4   Thematic Coding and Word Frequency Analysis

Following the extraction of insights from the three studies, a total of 24 distinct themes and 72 supporting references were identified (see Appendix I). These themes were categorized under each study and structured into a Word document, which was then imported into NVivo for qualitative analysis. Each of the three studies was treated as a parent node, and the respective themes were assigned as child nodes. All insights were coded accordingly.

To better understand the linguistic patterns across the studies and identify potential thematic overlap, a Word Frequency analysis was conducted individually for each dataset. The most frequently occurring terms were visualized as word clouds, allowing for a comparative examination of recurring concepts and problem areas.

In the first study (Figure 2.1), the most prominent terms include *"durable," "pens," "data," "bg" (blood glucose), "wasteful,"* and *"hygiene"*. This reflects a strong focus on the physical characteristics of insulin pens, such as device wastefulness, pen durability, hygiene concerns, and challenges related to blood glucose monitoring and data recording. Words like *"recorded," "cumbersome,"* and *"change"* point toward difficulties in data usage and behavior adaptation, aligning with usability concerns.

Figure 2.1. Word Cloud from the First Study: Generative Design Research

In contrast, the second study (Figure 2.2) emphasizes psychosocial and emotional dimensions. The most frequent terms include *"management," "self," "stress," "support," "motivation," "emotional,"* and *"structured."* These words highlight the internal burden of diabetes self-management and the need for external support, goal-setting, and structured transitions. Terms such as *"goals," "burden," "reflection," "accountability,"* and *"lifestyle"* further underline the emotional and behavioral themes that were prominent in this GLP-1 research.

Figure 2.2. Word Cloud for second Study: Research of Glucagon-Like Peptide-1

The third study (Figure 2.3) incorporates a broader cultural and socioeconomic context. Key terms include *"pens," "insulin," "cost," "switching," "affecting," "responsibilities," "alternative," "stigma," "diagnosis,"* and *"training."* This vocabulary reflects concerns about affordability, stigma, and device usage across different demographics in India. Words such as *"switching," "care," "family," "women," "access,"* and *"limited"* reinforce the challenges posed by economic constraints, gender roles, and inadequate education.
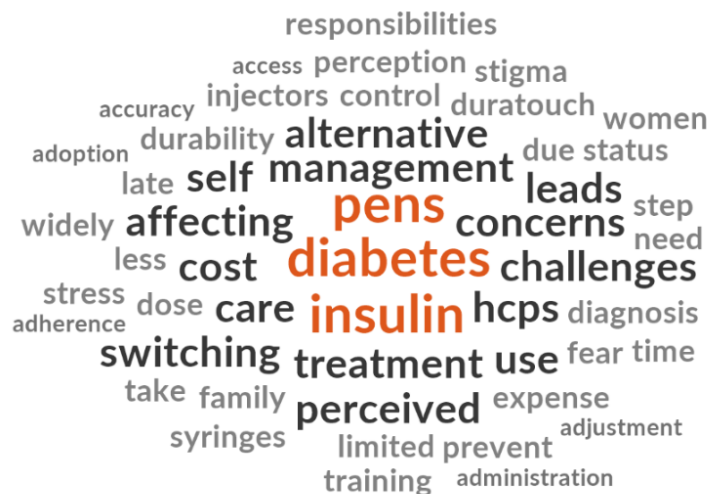

Figure 2.3. Word Cloud for third study: Living with diabetes in India

The comparison across the three figures shows how each dataset reflects different aspects of diabetes management:

- The first study highlights functional and usability concerns.
- The second study reveals emotional, behavioral, and social needs.
- The third study adds a strong contextual layer, emphasizing cultural, financial, and educational barriers.

Together, these findings provided the foundation for identifying overlapping themes and merging related topics into consolidated categories.

Following the frequency analysis, a detailed comparison was conducted between all references and their associated themes. Using thematic coding and color-based clustering in NVivo, as presented in Figure 2.4, similar themes across studies were grouped and merged.

Name	Files	References	Created on	Created by	Modified on	Modified by	
Challenges with	1	4	20/03/2025 12.55	NDR	25/03/2025 10.30	NDR	🟢
Data&Data Reco	1	4	20/03/2025 12.55	NDR	25/03/2025 10.37	NDR	⚫
Durability	1	4	20/03/2025 12.56	NDR	25/03/2025 10.37	NDR	🟣
Hygiene	1	4	20/03/2025 12.56	NDR	25/03/2025 10.37	NDR	🔵
Wastefulness	1	5	20/03/2025 12.57	NDR	25/03/2025 10.37	NDR	🟣
GLP-1 Research	0	0	20/03/2025 12.57	NDR	20/03/2025 13.13	NDR	
Blood Glucose (B	1	4	20/03/2025 13.10	NDR	25/03/2025 10.31	NDR	🟢
The Burden of Se	1	3	20/03/2025 13.13	NDR	25/03/2025 10.46	NDR	🔴
The Disconnect B	1	3	20/03/2025 13.09	NDR	25/03/2025 10.47	NDR	🔴
The Need for Str	1	3	20/03/2025 13.12	NDR	25/03/2025 10.47	NDR	🔴
The Psychologica	1	3	20/03/2025 13.11	NDR	25/03/2025 10.41	NDR	🟢
The Role of Self-	1	3	20/03/2025 13.13	NDR	25/03/2025 10.47	NDR	🔴
The Role of Socia	1	4	20/03/2025 13.10	NDR	25/03/2025 12.39	NDR	🔴
India Context	0	0	20/03/2025 12.57	NDR	20/03/2025 12.57	NDR	
Challenges with	1	2	20/03/2025 13.16	NDR	25/03/2025 12.31	NDR	🟡
Cultural & Religi	1	3	20/03/2025 13.14	NDR	25/03/2025 12.31	NDR	🔵
Durability and Pr	1	3	20/03/2025 13.17	NDR	25/03/2025 12.35	NDR	🟣
DuraTouch Feed	1	2	20/03/2025 13.18	NDR	25/03/2025 12.31	NDR	🟡
Economic Constr	1	2	20/03/2025 13.17	NDR	25/03/2025 12.36	NDR	🟢
Financial Barriers	1	2	20/03/2025 13.15	NDR	25/03/2025 12.36	NDR	🟢
Gender Roles an	1	3	20/03/2025 13.14	NDR	25/03/2025 12.32	NDR	🔵
Limited Understa	1	2	20/03/2025 13.15	NDR	25/03/2025 12.37	NDR	🔵
Need for Improv	1	2	20/03/2025 13.18	NDR	25/03/2025 12.37	NDR	🔵
Perception of Pe	1	2	20/03/2025 13.16	NDR	25/03/2025 12.31	NDR	🟡
Psychological Bu	1	2	20/03/2025 13.16	NDR	25/03/2025 10.50	NDR	🔴
Social Stigma an	1	3	20/03/2025 13.15	NDR	25/03/2025 12.39	NDR	🔴

Figure 2.4. Thematic structure in NVivo showing parent and child nodes. The three parent nodes represent the original studies, while the child nodes reflect the 24 coded themes. Colored indicators denote conceptual similarities across studies, which were later used to guide theme merging. The number of references coded under each theme is shown in the "References" column.

This process reduced the initial 24 themes to 10 overarching categories, as shown in Table 2.1:

Table 2.1. Merged Themes Across the Three Studies

Merged Theme	First Study	Second Study	Third Study
BG Monitoring & Emotional Stress	Challenges with Diabetes Management	Blood Glucose (BG) Monitoring as a Source of Emotional Stress / The Psychological Impact of Not Reaching Goals	
Data & Data Recording	Data & Data Recording		
Hygiene	Hygiene		
Device Durability & Wastefulness	Durability / Wastefulness		Durability and Practicality of Insulin Pens
Social Support & Stigma		The Role of Social Support	Social Stigma and Hidden Diabetes
Transition & Goal-Setting Support		The Need for Structured Transitions in Diabetes Management / The Role of Self-Reflection and Goal-Setting / The Burden of Self-Management and the Need for Accountability / The Disconnect Between Treatment & Everyday Life	Psychological Burden of Diabetes & Self-Management Stress
Cost & Accessibility			Financial Barriers to Diabetes Management / Economic Constraints Affecting Pen Adoption
Need for Better Education			Need for Improved Training and Instructions / Limited Understanding of Diabetes and Late Diagnosis
Pen Usability & Administration			Challenges with Pen Usage and Administration / Perception of Pen Injectors / DuraTouch Feedback and Design
Lifestyle Conflicts			Cultural & Religious Influences on Diabetes Management / Gender Roles and Family Responsibili

After merging the original 24 themes into 10 overarching categories based on conceptual similarity and frequency analysis, all references were reassigned to the corresponding newly created themes in NVivo. This step involved systematically reviewing each of the initial nodes and recoding the associated insights under the merged categories.The process involved systematically identifying and resolving redundant or overlapping insights across the original themes. Where repetition was identified, the most representative and concise version of the insight was retained to reduce duplication and enhance thematic clarity. The final set of coded references under the 10 merged themes formed the foundation for the value proposition development phase.

BG Monitoring & Emotional Stress.

This theme emerged from references in both the Generative Design Research and GLP-1 studies, highlighting the emotional weight patients place on blood glucose (BG) readings. BG data is often interpreted as a personal scorecard for success or failure, rather than a neutral health indicator. Unclear or fluctuating readings provoke anxiety, and many patients report feeling confused about their meaning. The psychological burden intensifies when high BG readings result in guilt or disengagement, sometimes leading to avoidance behaviors or emotional eating. Patients also describe a pattern of postponing treatment rather than perceiving it as neglect, reflecting the complex emotional negotiation involved in self-care routines. The most representative merged insights for this theme are summarized in Table 2.2. All NVivo references associated with this theme can be found in Appendix II.

Table 2.2. Theme: BG Monitoring & Emotional Stress

Ref #	Merged Insight
1, 2, 5	BG readings are perceived as indicators of personal success or failure rather than as tools for proactive treatment planning.
3, 6	Unclear or fluctuating BG readings create stress and confusion, making self-management more difficult.
7, 8, 11	High BG readings often lead to emotional eating or other unhealthy coping strategies.
9, 10	Failing to reach BG or HbA1c goals causes guilt and disengagement.
4	Delayed treatment is perceived as postponing rather than non-adherence.

Cost & Accessibility.

This theme, derived from the Indian Context study, centers around the financial constraints associated with diabetes treatment. Insulin therapy is largely financed out-of-pocket in India, making cost a decisive factor in treatment adherence. While insulin pens are preferred by many due to ease of use and comfort, their higher cost over time leads some patients to revert to vials and syringes. Even when patients favor pen devices, affordability often takes precedence. These trade-offs illustrate the tension between preferred treatment methods and economic feasibility. The consolidated insights are shown in Table 2.3, and all NVivo references for this theme are available in Appendix III.

Table 2.3. Theme: Cost & Accessibility

Ref #	Merged Insight
1	Treatment is an out-of-pocket expense, limiting access to care.
2, 4	Due to cost concerns, some patients switch from insulin pens to cheaper alternatives like vials and syringes, even if they prefer pens.
3	Insulin pens are perceived as more expensive over time.

Data & Data Recording.

This theme captures challenges related to how diabetes data is recorded, interpreted, and shared between patients and healthcare professionals. Across the first study, participants reported that while they regularly document blood glucose readings and other data, the ability to interpret this information without professional input is limited. Healthcare professionals are seen as gatekeepers of decision-making, and there is minimal confidence in adjusting treatment independently. Additionally, the absence of a standardized or seamless way to share recorded data results in frustration and inefficiencies during consultations. A summary of the consolidated insights is presented in Table 2.4, and the complete references for this theme are listed in Appendix IV.

Table 2.4. Theme: Data & Data Recording

Ref #	Merged Insight
1	Recorded data is difficult to interpret without HCP guidance.
2	HCP recommendations are followed closely, with little confidence in making independent treatment adjustments.
3	Data sharing with HCPs lacks standardization, creating inefficiencies.
4	The process of sharing and using data remains unclear and cumbersome.

Device Durability & Wastefulness.

This theme combines perspectives on product robustness, sustainability, and practical usability in reusable and prefilled insulin pens. Reusable pens are widely preferred over prefilled alternatives due to their perceived environmental benefits and durability. Despite differences in material (plastic or metal), users generally trust the robustness of all pens and do not associate specific materials with quality. Moreover, cartridge replacement in durable pens is not seen as a barrier, and both pen types are viewed as functionally equivalent. However, unresolved concerns remain around practical factors such as medical waste disposal, device malfunctions, and safe transportation in varying environments. Merged insights from this theme are listed in Table 2.5, and detailed NVivo references can be found in Appendix V.

Table 2.5. Theme: Device Durability & Wastefulness

Ref #	Merged Insight
1, 2, 3, 10	Prefilled pens are perceived as more wasteful than reusable or recyclable alternatives, which are preferred due to their durability and environmental benefits.
4	Medical waste disposal is a challenge due to recycling barriers.
5, 6	Durability is not associated with specific materials; robustness is trusted regardless of whether pens are made of plastic or metal.
7, 8, 9	Durable and prefilled pens are perceived as equally functional and easy to use.

Hygiene.

This theme centers around perceptions of cleanliness and safety in the use of insulin pens. Overall, hygiene is not perceived as a major concern, especially regarding the pen itself. Most users feel confident that their pens remain clean, particularly when kept in the protective cases. Concerns are more often directed toward needle hygiene, although even among those who reuse needles, few express discomfort or perceive hygiene as a pressing issue. Needle changing routines vary, but the behavior does not appear strongly tied to hygiene concerns. Merged insights are summarized in Table 2.6, and full references are listed in Appendix VI.

Table 2.6. Theme: Hygiene

Ref #	Merged Insight
1, 2	Users generally trust that insulin pens remain clean, especially when stored in protective cases.
3, 4	Needle-changing routines vary, but infrequent changing is not generally linked to strong hygiene concerns.

Lifestyle Conflicts.

This theme encompasses the social, cultural, and gender based tensions that interfere with consistent diabetes self-management. In the Indian context, traditional food customs and religious fasting often contradict structured treatment plans. Patients also report a widespread reliance on alternative medicine, which is typically tolerated by healthcare professionals in an effort to maintain trust. Additionally, significant gender imbalances were noted: while women frequently manage diabetes care for male family members, they receive less support when managing their own condition. Domestic responsibilities further limit their capacity for consistent self care. The merged insights are outlined in Table 2.7, and detailed references are listed in Appendix VII.

Table 2.7. Theme: Lifestyle Conflicts

Ref #	Merged Insight
1	Fasting and traditional food habits conflict with structured diabetes control.
2, 3	Alternative medicine is frequently used alongside or instead of medical treatment and is often tolerated by HCPs to preserve patient trust.
4, 5, 6	Women manage diabetes care for others but receive less support themselves, thus self care is deprioritized due to household responsibilities.

Need for Better Education.

This theme highlights gaps in both public and professional understanding of diabetes and its treatment. Misconceptions, such as attributing diabetes solely to sugar intake, persist, and many diagnoses occur only after severe symptoms arise. This reflects a lack of early education and awareness. At the same time, healthcare professionals express the need for more structured training resources before confidently recommending specific treatment tools such as insulin pens. The merged insights are summarized in Table 2.8, and full references are available in Appendix VIII.

Table 2.8. Theme: Need for Better Education

Ref #	Merged Insight
1, 2	Lack of public awareness leads to misconceptions about diabetes and delayed diagnosis.
3, 4	Healthcare professionals require clear, structured training tools (videos, guides, QR codes) to confidently recommend insulin pens and support patient education.

Pen Usability & Administration.

This theme includes patient and professional perspectives on the ease of use and reliability of insulin pen injectors. Patients generally describe pens as convenient and less painful than alternatives. However, both patients and healthcare professionals express concerns about usability safety. Patients report anxiety about accidental underdosing or unknowingly using empty cartridges. Similarly, HCPs highlight the risk of misadministration, especially among patients with low literacy or limited instruction. A summary of the merged insights is provided in Table 2.9, and all references are included in Appendix IX.

Table 2.9. Theme: Pen Usability & Administration

Ref #	Insight
1	Pen injectors are perceived as more convenient and less painful than alternatives.
2, 5	Fear of incorrect dosing and unknowingly using an empty cartridge creates anxiety. HCPs also express concerns about proper insulin delivery and dosage accuracy.
3	HCPs worry about misadministration among those with low literacy.
4	DuraTouch is considered easy to use, with a smooth dose adjustment mechanism.

Social Support & Stigma.

This theme illustrates the complex role of interpersonal relationships in diabetes self-management. Many patients report feeling emotionally isolated due to a lack of understanding from close family and friends. While some seek support through online communities, this form of connection is often perceived as insufficient in day-to-day life. In contrast, patients with strong emotional and practical support tend to experience better treatment adherence and psychological well-being. Alongside these relational dynamics, stigma remains a barrier, leading some individuals to avoid injecting insulin in public or delay treatment to avoid social judgment. A summary of the merged insights is presented in Table 2.10, with full references available in Appendix X.

Table 2.10. Theme: Social Support & Stigma

Ref #	Merged Insight
1, 2, 4	Patients often feel emotionally isolated; family and friends may not fully understand their challenges, and online communities provide limited emotional support.
3	Strong social support improves treatment adherence and emotional well-being.
5, 6, 7	Stigma leads to hiding one's condition, avoiding insulin injections in public, and delaying treatment due to fear of social judgment.

Transition & Goal-Setting Support.

This theme captures the challenge of transitioning into diabetes management and sustaining motivation over time. Patients often find it difficult to apply rigid clinical guidelines in the context of daily life, especially when structured transition support is missing. While some succeed through gradual planning and setting small goals, others feel overwhelmed by the burden of managing their condition alone. Emotional fatigue, stress, and treatment neglect frequently result from this burden. Support from healthcare professionals or trusted family members significantly reduces the mental load and fosters confidence during adjustment. A summary of merged insights is shown in Table 2.11, with references detailed in Appendix XI.

Table 2.11. Theme: Transition & Goal-Setting Support

Ref #	Merged Insight
1, 2, 3, 4, 5	Patients struggle to integrate structured diabetes routines into everyday life, especially when support during the transition is lacking.
6, 12	Motivational support from trusted healthcare professionals or family members helps patients feel less burdened and more engaged.
7, 8, 9	Self-reflection, personal goal-setting, and gradual lifestyle planning enhance confidence and treatment adherence.
10, 11, 13, 14	The mental and emotional toll of managing diabetes alone often leads to fatigue, overwhelm, and treatment neglect.

2.5 Value Propositions Formulation

The next step in the process was to turn the reduced insights into value propositions. Each insight was rewritten as a short statement that reflects something people with diabetes might care about. After this, the statements were checked again for overlap, and those that repeated similar ideas were matched.

The phrasing of the value propositions followed guidance from sources in survey and health communication, including *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method* [Dillman et al., 2014], and the CDC's Everyday Words for Public Health Communication [CDC, 2016]. To make the language feel natural and familiar, expressions often used in online diabetes communities, like Facebook groups, were also considered. Research in survey design shows that using everyday language helps people answer more accurately and with less effort, especially in online surveys [Dillman et al., 2014; Sudman et al., 1996]. The reduction of the initial list was done only by removing value propositions that were overlapping. No other inclusion or exclusion criteria were applied at this point. Osterwalder's Value Proposition

Canvas [Osterwalder et al., 2014] was used as a framework, to guide the formulation of the value propositions. Each insight was examined through the two main components of the canvas: the Customer Profile and the Value Map. The Customer Profile helped clarify the perspective of people living with diabetes by identifying:

- **Job to be done:** the tasks or challenges they try to manage in daily life.
- **Pains:** the barriers or frustrations that make those tasks difficult.
- **Gains:** the outcomes or experiences they hope to achieve.

The Value Map was used to think about how possible products or services could support those needs:

- **Products and Services:** what can be offered to support their daily challenges
- **Pain Relievers:** how those offerings can reduce or remove key barriers
- **Gain Creators:** how they can help people achieve their desired outcomes

Each insight from the analysis was taken through these steps. The process involved identifying the underlying job, pain and gain, and then reflecting on what kind of support would help address that. A detailed mapping of each individual insight to its corresponding value proposition can be found in Appendix XIII. This includes the full Customer Profile and Value Map for each insight, showing how specific challenges, needs, and opportunities were translated into the final value statements. The resulting set of 19 value propositions is presented in Appendix XII.

2.6 Reducing the Number of Value Propositions

To reduce the number of value propositions to a manageable and actionable set, a workshop was held by stakeholders from Novo Nordisk. The participants represented a variety of roles:

- User Researcher and UX Lead
- Industrial Designer and UX Lead
- Strategic Designer
- Mechanical Design & Device Project Lead
- Commercial Device Project Lead

During the workshop, each value proposition was evaluated using the following four criteria:

1. **Relevance:** Is the proposition meaningful and important from the user's perspective?
2. **Clarity:** Is the proposition clearly worded and easy to understand?
3. **Differentiation:** Does the proposition express a unique need not already captured by other propositions?
4. **Actionability:** Can the proposition be translated into concrete design opportunities or development decisions?

An example of how one participant applied these criteria to assess and prioritize value propositions is shown in Figure 2.5. The figure illustrates how individual propositions were evaluated based on their relevance, clarity, differentiation, and actionability, leading to their final categorization.

Figure 2.5. Example of how a participant categorized value propositions using the four evaluation criteria. This example illustrates how clarity, relevance, differentiation, and actionability informed the overall prioritization.

After all value propositions had been reviewed against these four criteria, the participants used the results of this assessment to inform a further prioritization process. Drawing on the insights for relevance, clarity, differentiation, and actionability, each value proposition was then categorized into one of three levels of perceived importance:

- Most important
- Somewhat important
- Less important

A visual example of this prioritization process is presented in Figure 2.6.
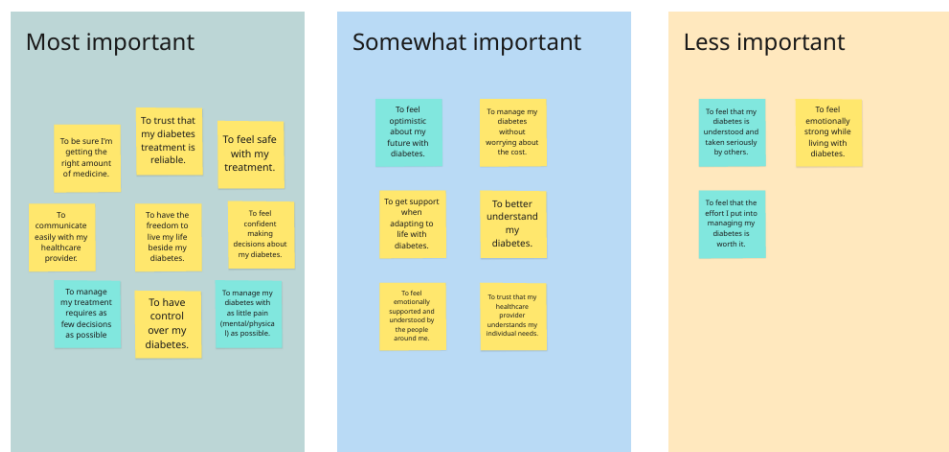
Figure 2.6. Illustrative example of a participant's categorization of value propositions. Based on their assessment across the four criteria—relevance, clarity, differentiation, and actionability—each proposition was assigned a level of importance.

As part of the **Clarity** assessment, participants also suggested wording improvements for several value propositions. These suggestions were reviewed and incorporated to ensure the final wording was clear and concise.

Based on the workshop results, 10 value propositions were selected. Each of these received a *Most important* rating from at least two participants.

To further enhance clarity and relatability, all value propositions were reformulated using first-person framing. For example, the initial formulation "To have control over my diabetes" was revised to "I feel in control of my diabetes." This shift is supported by research in survey methodology, which shows that personalized and relatable question wording improve comprehension, cognitive engagement, and the naturalness of response evaluation [Tourangeau et al., 2000].Similarly, the use of personal, framing aligns with best practices in health-related conjoint analysis. Studies in which respondents evaluate choices from a realistic, personal perspective have been found to yield more valid and easily understood responses [Bridges et al., 2011].

The final selected value propositions are listed in Table 2.12.

Table 2.12. Final Value Propositions Selected Through Workshop Analysis

VP No.	Value Proposition	Mentions
1	I feel sure I am getting the right amount of medicine	4
2	I trust that my diabetes treatment is safe and reliable	4
3	I feel free to live my life alongside my diabetes	4
4	I feel confident making decisions about my diabetes	4
5	I have a simple treatment routine	4
6	I can communicate easily with my healthcare provider	3
7	I feel in control of my diabetes	3
8	I experience as little pain as possible when taking my diabetes treatment.	2
9	I feel emotionally strong while living with diabetes	2
10	I get support when adapting to life with diabetes	2

2.7   Evaluating Methods for Prioritizing Value Propositions

Following the selection and refinement of the value propositions, the next step was to prioritize them based on user preferences. This prioritization was conducted as part of a broader international survey administered by Novo Nordisk, involving 400 participants across four countries (100 per country). The survey primarily consisted of demographics and questions using 5-point Likert scales. The value proposition prioritization was embedded as a short segment at the end of this survey, offering a valuable opportunity to collect feedback from a large and diverse sample in a realistic testing environment.

To make the most of this opportunity, it was important to reduce the number of value propositions to a manageable set and select a prioritization method that would fit seamlessly into the flow of the survey, remain cognitively accessible and yield meaningful comparative data. Three methods were considered: Best-Worst Scaling, Ranking by Elimination, and Pairwise Comparison. Each was evaluated based on methodological rigor, cognitive demands, and fit with the survey context.

Best-Worst Scaling (BWS)

Best-Worst Scaling requires participants to choose both the most and least important item from a subset of options. It has been widely applied in healthcare and marketing research to generate rich preference data and avoid issues such as scale use bias or central tendency bias [Hollin et al.,

2022]. Scale use bias refers to systematic differences in how respondents use rating scales, such as consistently avoiding extreme options, while central tendency bias describes the tendency to choose middle or neutral responses regardless of true preference.

However, BWS assumes that participants are willing and able to make strong comparative judgments, which may be challenging when evaluating emotionally nuanced or closely related statements. It also typically requires multiple sets of comparisons to be statistically robust, which can increase cognitive burden and risk of disengagement if not carefully designed [Flynn et al., 2007]. In the specific setting of this survey, BWS posed a potential risk of overload or reduced response quality.

Ranking by Elimination (RBE)

Ranking by Elimination involves progressively removing the least preferred options until a final ranking emerges. This method mirrors decision-making processes found in real world settings and can be effective for narrowing down broad option sets [Tversky, 1972a].

However, RBE is vulnerable to early order bias and preference instability. Early order bias occurs when initial eliminations disproportionately influence the final outcome. Preference instability refers to inconsistent choices that can arise when participants struggle to rank closely related or emotionally nuanced items. It also places considerable cognitive demands on respondents, who must continually re-evaluate the remaining options [Bridges et al., 2011]. These challenges may be particularly problematic when value propositions are perceived as similarly important or emotionally complex.

Pairwise Comparison (PC)

Pairwise Comparison involves comparing two value propositions at a time and selecting the one that feels more valuable. It has been successfully used in health research, decision analysis, and usability studies for its simplicity and clarity [de Bekker-Grob et al., 2015]. By reducing complex trade-offs to binary decisions, PC makes it easier for participants to engage meaningfully, even when evaluating emotionally charged or overlapping concepts [de Bekker-Grob et al., 2015].

Pairwise Comparison was also a practical fit for the survey conditions. Its simple structure aligned well with the design of the broader questionnaire and the task places minimal cognitive demands on participants and allow them to engage with the prioritization in a straightforward way.

Experimental Design 3

3.1 Pilot Test

Following the selection of the prioritization method, the next step was to prepare the survey for testing. The final selected ten value propositions yield a total of 45 unique pairwise comparisons, calculated using the simplified combinatorial formula:

$$\binom{n}{2} = \frac{n(n-1)}{2}$$

In this case, $n = 10$, resulting in:

$$\binom{10}{2} = \frac{10 \times 9}{2} = 45$$

Here, n represents the total number of value propositions being compared. This formula determines how many unique pairs can be formed.

Each participant was randomly assigned 15 out of the 45 possible comparisons. Additionally, the order of value propositions within each pair was randomized to mitigate potential order effects, ensuring that no single proposition consistently appears first or second across tasks.

To evaluate both the clarity of the survey content and the feasibility of completing it within 5 to 7 minutes, a pilot test was conducted using a digital interface. The interface was developed using HTML, JavaScript, CSS, and PHP, and hosted on Aalborg University's internal server. It was designed specifically for the pilot phase and included the following components: a consent form, demographic questions (age, diabetes type, gender, education level), a brief guide, and the pairwise comparison survey. The pilot interface can be accessed online at: https://pdp10-nicoleta.es.aau.dk/index.html.

Timing data were collected in two ways: total survey time (starting when participants began the comparison tasks) and individual response time for each of the 15 comparisons. Time spent on earlier pages, such as the consent form or demographics, was not included in the analysis, as the focus was on the cognitive load and pacing during the core survey content. Recording individual comparison times allowed for the identification of any patterns or specific value proposition pairs that might consistently require more time to assess.

The user flow of the interface followed this structure:
Consent form → Demographics → Guide → Survey.

A total of 13 participants completed the pilot test online, on personal devices. 9 identified as female and 4 as male. 11 participants reported having Type 2 diabetes, while 2 participants reported having Type 1 diabetes.

The recorded completion times for the 15 pairwise comparisons ranged from 3 minutes and 36 seconds to 6 minutes and 10 seconds. The average completion time was 4 minutes and 40 seconds, with a median of 5 minutes and 2 seconds. Based on these results, it is concluded that the survey can be completed within the targeted time window of 5 to 7 minutes.

In addition to overall duration, response times were recorded for each individual comparison. While some comparisons occasionally took slightly longer than others, no consistent patterns emerged across participants. That is, no specific value proposition pair, such as VP1 compared with VP5, was found to consistently take longer to evaluate than others. The variation in timing appeared to be random and participant specific, suggesting that the complexity or clarity of particular comparisons did not systematically impact response time.

In paired comparison tasks, response reliability refers to how consistently a participant makes judgments between alternatives. One way to evaluate this is by examining circular triads: specific patterns of preferences that violate the principle of transitivity. A circular triad occurs when a participant prefers value proposition A over B, B over C, but then C over A. Such a cycle indicates inconsistency in the participant's evaluation, as it contradicts the logic that if A is better than B and B is better than C, then A should be better than C [Kendall and Smith, 1940]. The results indicated that 11 participants had fewer than 30% circular triads, suggesting a generally consistent pattern of preferences. In contrast, two participants showed a circular triad ratio of 50%, potentially indicating lower reliability. These two participants also completed the task in considerably less time than the rest, which may point to superficial engagement with the comparisons. Overall, the majority of responses reflected meaningful and structured distinctions among the value propositions.

3.2   Survey

Novo Nordisk designed and commissioned the survey to be conducted among people living with diabetes. As part of this initiative, the addition of the pairwise comparison module was proposed, to be placed at the end of survey, within a 5–7 minute time slot. The survey was implemented by **SAGO**, a global market research firm specializing in healthcare and consumer insights. SAGO was responsible for participant recruitment, survey administration, and data collection. Participants were financially compensated to encourage participation.

The survey was conducted across four countries—United States, Canada, Germany, and the United Kingdom, with 100 participants from each country, totaling 400 respondents. Eligibility was based on predefined screening criteria: adults aged 18–75, currently diagnosed with Type 1 or Type 2 diabetes, and currently treating their condition with either insulin or GLP-1-based injectable medications. A representative age distribution and an even spread across occupational

categories were required.

The survey structure included screening items, main questionnaire sections, the pairwise comparison module and demographic questions. The flow of the entire survey, including integration of the comparison module, are illustrated in Figure 3.1.
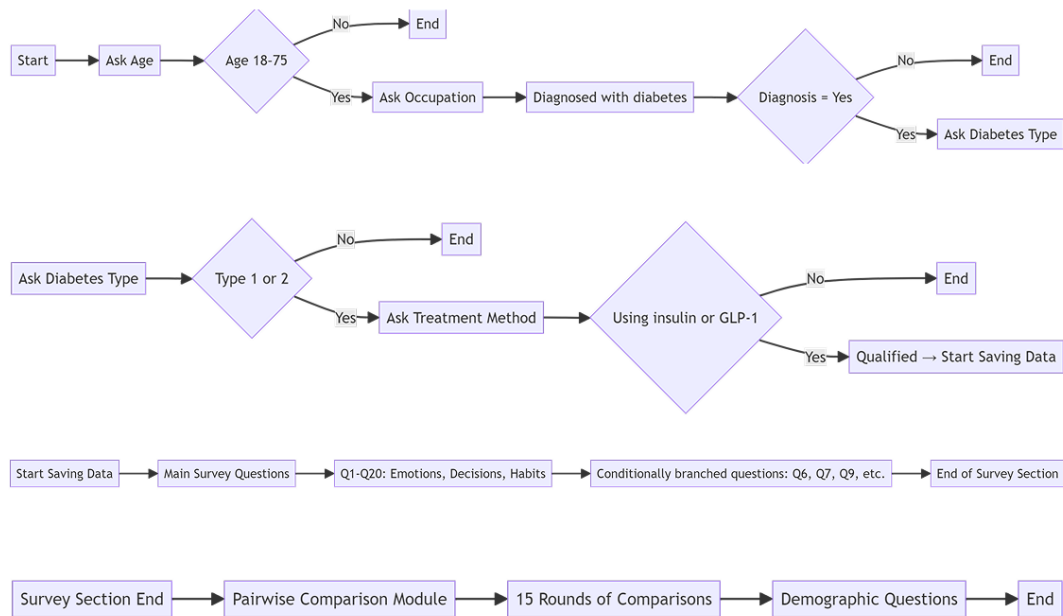

Figure 3.1. Survey flowchart showing participant screening, main survey components, and integration of the pairwise comparison module.

The pairwise comparison module presented participants with repeated binary choices between value statements related to diabetes management. Each participant was asked the following question:

Which of the following two statements do you value most?

Note: You may see some statements more than once. This is intentional, as it helps us understand how they are valued in different contexts.

The entire set of requirements for implementing the pairwise comparison module, delivered to SAGO for execution, are presented in Appendix XIV.

The dataset received included an Excel file with two sheets:

- One containing raw response data.
- One containing variable descriptions and labels.

Demographic and clinical characteristics collected as part of the broader survey are used in subsequent analysis of the pairwise comparison data.

Data Analysis 4

4.1 Descriptive Analysis

This section presents a descriptive summary of the dataset used for the study. The analysis includes the demographic distribution of participants and their diabetes type classification.

A total of 395 participants were included in the dataset. The median interview length across all participants was 7 minutes and 37 seconds. The gender distribution among participants is as follows:

- 257 identified as male,
- 136 identified as female,
- 2 identified as non-binary.

In terms of diabetes type:

- 333 participants were diagnosed with Type 2 diabetes
- 62 participants have Type 1 diabetes.

These descriptive statistics provide an overview of the sample composition and serve as a foundation for more detailed analyses in subsequent sections.

4.2 Paired Comparisons Analysis

This section presents the analytical approach and results derived from the paired comparisons conducted in the study. The analysis begins by evaluating the reliability of participants' responses through checks for consistency. A compound preference matrix was constructed and used to estimate normalized preference scores via the Bradley–Terry–Luce (BTL) model. These scores reflect how strongly each value proposition was preferred, on average, across all participants.

To further explore the underlying drivers of these preferences, the Elimination-by-Aspects (EBA) model was applied. This model considers how specific aspects of the value propositions influence decision-making. A comparison between the BTL and EBA models was conducted to determine whether participants' choices are better explained by a single preference scale or by multiple, attribute-based considerations.

Response Reliability

To assess whether the participants have provided reliable responses, the data were examined for patterns of transitivity. In a complete paired comparison design, where a participant evaluates

all possible pairs of N objects, the total number of possible unique triads is given by the equation:

$$T = \frac{N^3 - N}{24}$$

This formula calculates the number of unique combinations of three distinct items and evaluates them for potential circularity [Kendall and Smith, 1940]. In this study, participants evaluated 15 out of the 45 possible pairwise comparisons between 10 value propositions, resulting in incomplete comparison profiles. Consequently, not all potential triads could be analyzed for each participant. A triad was only considered in the analysis if all three required pairwise comparisons were present in the participant's data. For each participant, the proportion of circular triads was calculated by dividing the number of circular triads by the number of valid triads available. Participants with a circular triad proportion exceeding 30% were excluded from further analysis Lund et al. [2023]. As a result, 84 participants were removed from the dataset due to exceeding this threshold.

Compound Preference Matrix

After excluding participants with more than 30% circular triads, a compound preference matrix was constructed. This matrix aggregates all pairwise judgments from the remaining reliable participants. Each cell (i, j) in the matrix represents the number of times value proposition i, that corresponds to the row , was preferred over value proposition j, that corresponds to the column.

The matrix is shown in Table 4.1.

Table 4.1. Compound preference matrix showing the number of times each value proposition was preferred over another.

	1	2	3	4	5	6	7	8	9	10
1		41	48	48	63	44	48	73	57	59
2	59		67	76	66	52	64	78	80	75
3	55	38		45	60	55	58	62	70	67
4	52	29	67		50	52	48	69	66	66
5	45	36	40	49		41	45	54	57	59
6	60	49	51	55	60		46	55	73	62
7	56	42	46	62	55	60		65	82	64
8	32	28	39	36	48	41	39		37	51
9	43	27	38	39	45	30	22	61		54
10	40	31	39	36	39	41	41	58	54	

Bradley–Terry–Luce (BTL) model

The Bradley–Terry–Luce (BTL) model is a probabilistic model used to estimate the relative preferences of items based on pairwise comparison data [Wickelmaier and Schmid, 2004]. It assumes that each item has an underlying preference strength, and the probability of one item being chosen over another depends on the ratio of these strengths.

Using the compound preference matrix as input to the BTL model, a set of normalized preference scores was estimated for each value proposition. These scores reflect the relative strength of preference across all reliable participants. A higher score indicates a stronger overall preference. The scores have been normalized such that the most preferred item has a value of 1.0 [Wickelmaier and Schmid, 2004]. The resulting values are presented in Table 4.2.

Table 4.2. Normalized BTL preference scores for each value proposition.

VP	Normalized Score
1	0.130
2	1.000
3	0.248
4	0.180
5	-0.203
6	0.324
7	0.403
8	-0.760
9	-0.724
10	-0.599

Preference Scores with Confidence Intervals

Figure 4.1 presents the normalized BTL preference scores for each of the ten value propositions, alongside 95% confidence intervals. These scores reflect the relative strength of preference across all reliable participants, normalized such that the highest-scoring proposition is set to 1.0. The confidence intervals provide a visual indication of the uncertainty surrounding each estimate.

The results show that the value proposition *"I trust that my diabetes treatment is safe and reliable"* stands out clearly as the most strongly preferred, with a significantly higher score than all other items and a relatively narrow confidence interval. Other highly rated propositions include *"I feel in control of my diabetes"*, *"I can communicate easily with my healthcare provider"*, and *"I feel free to live my life alongside my diabetes"*, all of which received moderately positive scores and overlapping confidence intervals, suggesting similar levels of preference.

On the lower end of the scale, propositions such as *"I experience as little pain as possible when taking my diabetes treatment"*, *"I feel emotionally strong while living with diabetes"*, and *"I get support when adapting to life with diabetes"* were consistently rated lower, with negative normalized scores and non-overlapping confidence intervals when compared to the top propositions. This indicates a statistically meaningful difference in how these items were perceived.

Overall, the results suggest that participants placed the greatest importance on trust and confidence in the safety and reliability of their treatment, while emotional support and physical discomfort were less central in their evaluations.
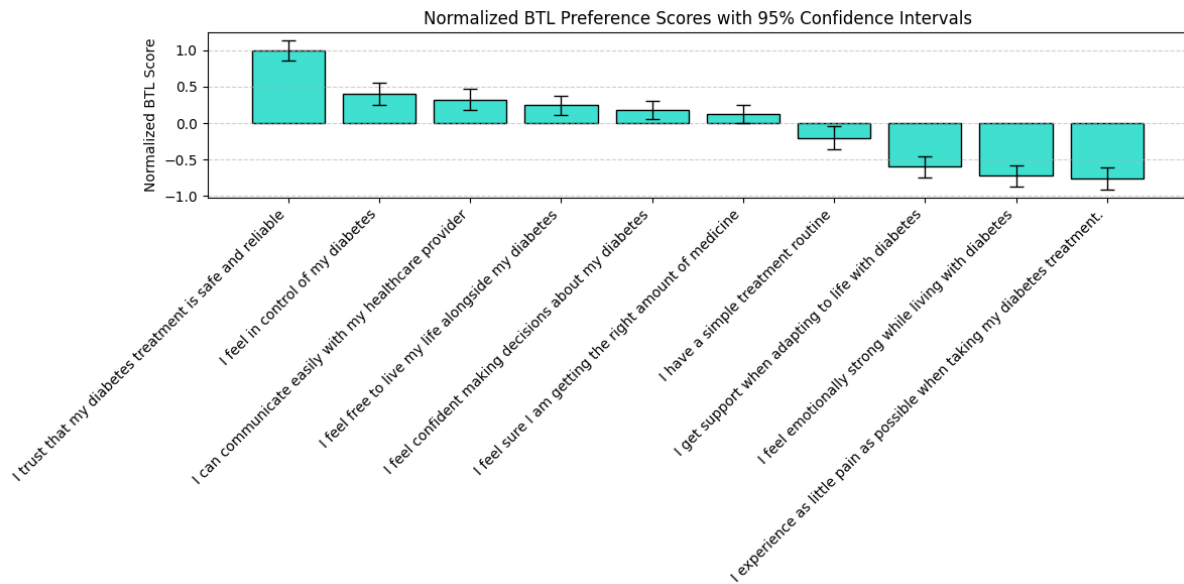
Figure 4.1. Normalized BTL preference scores for value propositions, with 95% confidence intervals.

Categorization of Value Propositions for EBA Modeling

The BTL model assumes that people always choose between two options based on a single, consistent scale of preference. However, this may not reflect how people actually make decisions. In some cases, two items may feel very similar, or the person may focus on different features when comparing different pairs. To handle this, a more flexible model called Elimination by Aspects (EBA) was used [Lund et al., 2023]. The idea behind EBA is that people pay attention to specific features, or aspects, of the options they are comparing. If two items share the same features, the choice might be based on other differences [Tversky, 1972b]. This model allows preferences to be based on more than one dimension. To apply the EBA model, five aspects were defined based on the content of the value propositions:

- **Treatment Confidence (TC)**: A general sense of trust, clarity, and understanding related to how treatment is managed and delivered.
- **Emotional Aspects (EA)**: The internal emotional experience of living with diabetes, including how it affects identity, mindset, and personal well-being.
- **External Support (ES)**: Support or help received from healthcare providers or other people.
- **Time Efficiency (TE)**: How simple or time-saving the treatment is in daily life.
- **Physical Comfort (PC)**: How comfortable the treatment is in terms of pain or physical discomfort.

Each value proposition was reviewed and assigned to one of these categories. Table 4.3 shows the full overview.

Table 4.3. Categorization of value propositions into decision-making aspects. An "X" indicates the presence of the aspect for a given proposition.

Value Proposition	TC	EA	ES	TE	PC
I feel sure I am getting the right amount of medicine	X				
I trust that my diabetes treatment is safe and reliable	X				
I feel free to live my life alongside my diabetes		X			
I feel confident making decisions about my diabetes		X			
I have a simple treatment routine				X	
I can communicate easily with my healthcare provider			X		
I feel in control of my diabetes	X				
I experience as little pain as possible when taking my diabetes treatment					X
I feel emotionally strong while living with diabetes		X			
I get support when adapting to life with diabetes			X		

Note: TC = Treatment Confidence, EA = Emotional Aspects, ES = External Support, TE = Time Efficiency, PC = Physical Comfort.

Elimination by Aspects (EBA)

To better understand how individual aspects influenced participants' preference judgments, an EBA model was applied using the binary aspect matrix. The EBA model estimates how strongly each aspect contributed to choices across all pairwise comparisons. The results are presented in Figure 4.2.
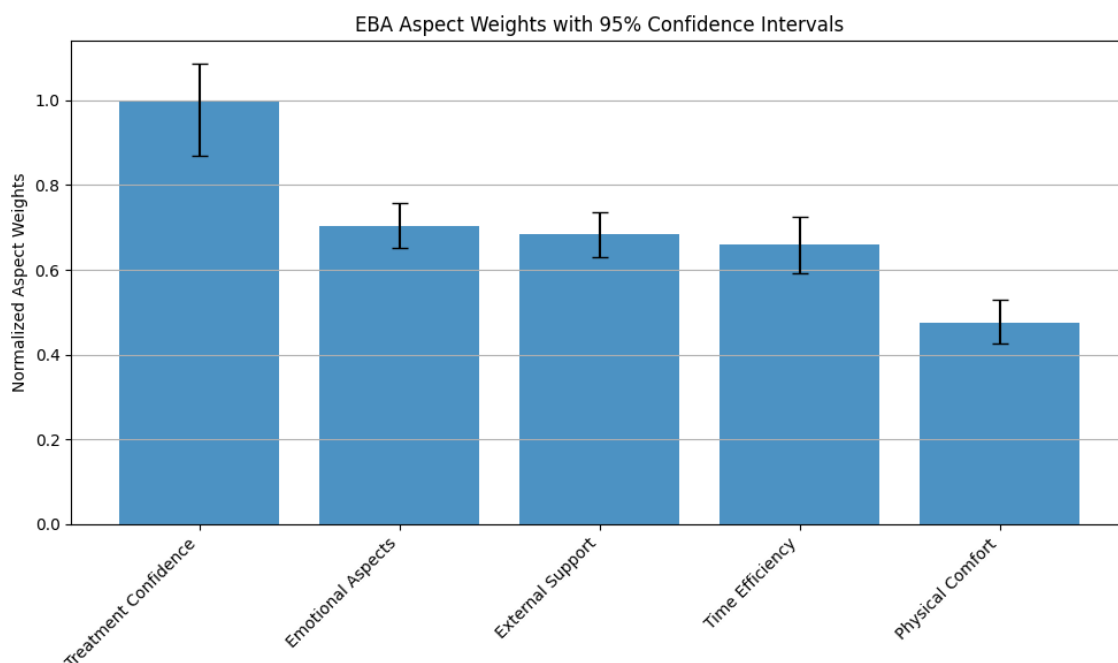
Figure 4.2. Estimated aspect weights from the EBA model with 95% confidence intervals.

The results show that **Treatment Confidence** received the highest weight by a clear margin, indicating it was the most decisive aspect in guiding preferences. Its confidence interval does not overlap with those of any other aspects, suggesting a statistically meaningful dominance.

Emotional Aspects, **External Support**, and **Time Efficiency** had lower but very similar weights, with substantially overlapping confidence intervals. This indicates that these three aspects were perceived as comparably influential in the decision-making process.

Physical Comfort received the lowest average weight, and its confidence interval did not overlap with the other aspects, suggesting that this factor contributed significantly less to participants' preferences.

Model Comparison: BTL vs. EBA

To evaluate whether participants' preferences were better explained by an unidimensional scale or by multiple attribute-based considerations, a statistical comparison was made between the BTL model and the EBA model.

A likelihood ratio test was conducted to assess whether the increased flexibility of the EBA model significantly improved the fit. The test results are presented in Table 4.4

Table 4.4. Model comparison between the BTL and EBA models using log-likelihood and likelihood ratio test.

Model	Log-Likelihood	Degrees of Freedom	χ^2 (LR Test)	p-value
BTL	-3108.85	9	5337.98	$< .001$
EBA	-5777.86	5		

This result indicates that the EBA model fits the observed data significantly better than the BTL model, with a p value $p < 0.001$. This suggests that participants' preferences were not simply based on an overall ranking of value propositions but were instead influenced by specific perceptual aspects assigned to each item.

Model Diagnostics

To assess how well each model captures the structure of the observed preferences, standardized residuals were computed and evaluated using normal Q-Q plots. These plots compare the distribution of model residuals to the expected distribution under normality, with better fitting models showing closer alignment to the diagonal reference line.

Figure 4.3 presents the Q-Q plots for the BTL and EBA models. The left panel shows residuals computed at the level of individual value propositions (VPs) under the BTL model, while the right panel shows residuals aggregated at the aspect level under the EBA model. In the BTL plot, the residuals show a moderate overall deviation from the theoretical quantiles. While the points roughly follow the red dashed line, they moderately diverge across the full range. In contrast, the Q-Q plot for the EBA model shows a much tighter alignment with the reference line. The residuals are distributed more symmetrically and remain very close to the expected values throughout.
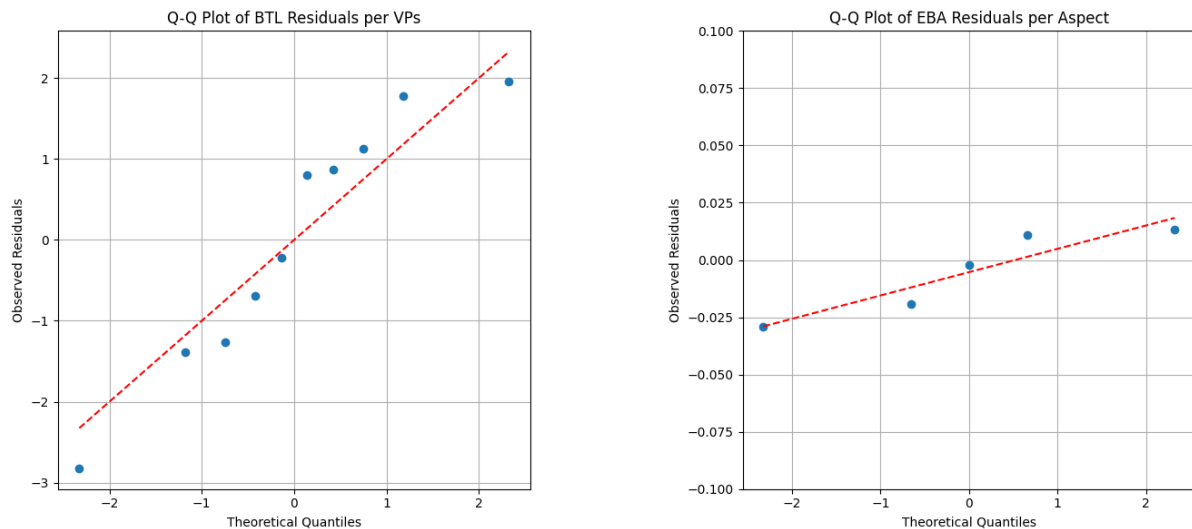
Figure 4.3. Normal Q-Q plots of standardized residuals for the BTL model (left, per value proposition) and the EBA model (right, per aspect).

Residual Patterns Relative to Model Scores

The next diagnostic step was to examine whether the residuals are systematically related to the model. Figure 4.4 displays this relationship for each model.
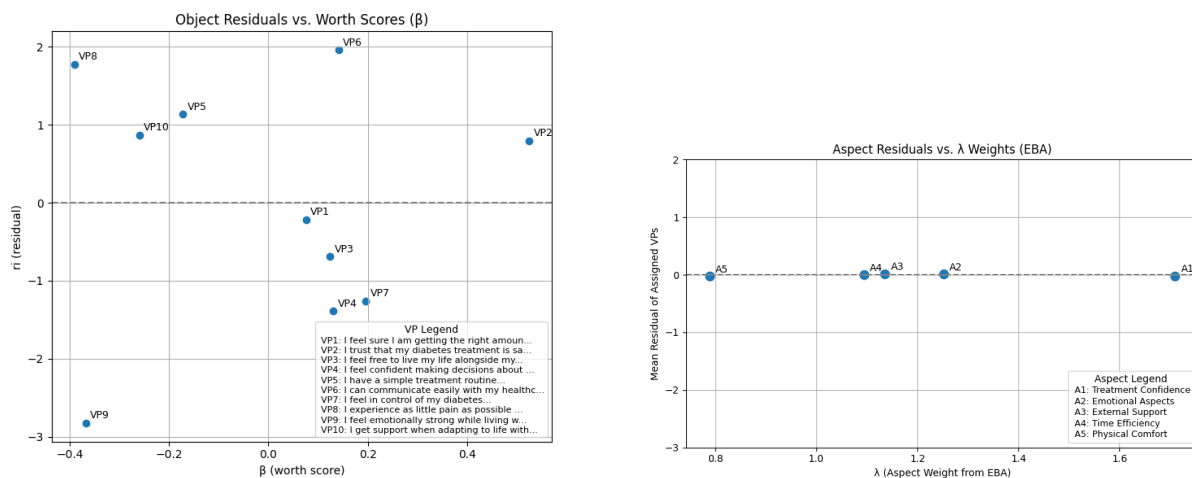

Figure 4.4. Relationship between residuals and model scores. Left: Value Propositions residuals versus BTL worth scores. Right: mean residuals per aspect versus EBA weights.

In the BTL plot (left), several value propositions show notable deviations from the horizontal reference line, indicating that some items are consistently over- or under-predicted by the model. In contrast, the EBA plot (right) displays residuals aggregated at the aspect level, with each point representing an aspect's residual plotted against its estimated weight. Here, residuals are consistently centered near zero across all five aspects, suggesting a better overall model fit.

Discussion 5

This chapter reflects on several factors that may have influenced the outcomes of the paired comparison analysis. While the BTL and EBA models helped uncover patterns in how people living with diabetes evaluated the value propositions, certain methodological choices could have affected the results. These include how the value propositions were formulated, how aspects were assigned and the characteristics of the participant sample.

Formulation Bias in Value Propositions

One of the primary factors that may have influenced the observed results, particularly the divergence between the BTL and EBA model fits, is potential bias in the formulation of the value propositions themselves. Although a workshop involving five participants from Novo Nordisk was held to reduce the initial number of value propositions, the development of the ten items was undertaken independently by one person, without direct involvement from individuals with diabetes or clinical experts. Moreover, time constraints and limited prior experience in the diabetes context may have contributed to a degree of subjectivity in wording and conceptual coverage.

Because the EBA model relies on clearly defined aspects to explain preferences, any overlap or ambiguity in how value propositions are categorized can reduce its accuracy. For example, if a proposition addresses both emotional and practical concerns but is assigned to only one aspect, it may blur the distinctions the model is trying to capture. In contrast, the BTL model ranks propositions along a single preference scale and is less affected by this kind of overlap in meaning.

Future studies should consider a more systematic and collaborative approach to item formulation, potentially involving participatory design with patients, clinicians, and domain experts. Pre-testing value propositions using cognitive interviews or dimensionality reduction techniques such as exploratory factor analysis could also help ensure clearer and more distinct aspect assignments.

Dimensional Assignment and Aspect Structure Validity

The Elimination by Aspects (EBA) model relies on a structured assumption: that each value proposition represents one meaningful aspect of decision-making. In this study, five aspects were defined to reflect common considerations in diabetes care, such as emotional well-being, treatment simplicity, and physical comfort. Each of the ten value propositions was then manually assigned to one of these aspects.

While this approach provided a clear foundation for EBA modeling, the assignment process was

carried out independently by a single individual and was not validated through group review, patient input, or formal testing. As a result, the aspect categorization may reflect subjective interpretations, which could affect the model's ability to capture how people actually differentiate between propositions.

In particular, the model assumes that the aspects are mutually exclusive and reflect distinct psychological dimensions. However, in practice, some items may span multiple aspects or share conceptual overlap. This can blur the distinctions EBA relies on and reduce its explanatory power. For instance, a value proposition about feeling confident may carry emotional and practical implications at once, even if it was placed under just one category.

A more robust dimensional assignment would likely benefit from collaborative tagging involving both domain experts and people living with diabetes. It could also be supported by methods such as card sorting, factor analysis, or content validation panels. These steps could help ensure that each aspect truly represents a unique and consistent line of reasoning in how people evaluate treatment-related preferences.

Model Interpretation: BTL vs. EBA

This study used two different statistical models to understand how participants made choices between value propositions: the Bradley-Terry-Luce (BTL) model and the Elimination by Aspects (EBA) model. While both are grounded in paired comparison theory, they rely on different assumptions about how people make decisions.

The BTL model treats preferences as lying along a single underlying scale. It assumes that participants compare items holistically and choose the one they prefer overall. This approach is simple and effective when preferences are consistent and not driven by specific features of the items.

In contrast, the EBA model assumes that people consider individual aspects of items and eliminate options that lack desirable features. This allows the model to reflect more complex reasoning, where preferences may shift depending on which aspects are present or absent in each pair.

In the results of this study, the EBA model achieved a significantly better fit to the data than the BTL model, as indicated by a large likelihood ratio and a highly significant p-value. This suggests that participants were not simply ranking items on a single scale but were likely considering different factors when making their decisions.

At the same time, the improved fit of the EBA model should be interpreted in context. As discussed earlier, both the formulation of the value propositions and the assignment of aspects may have introduced variability or noise. This means that some of the advantage observed in the EBA model may also reflect how the items were structured, rather than a true difference in cognitive process.

Still, the comparison offers useful insight. The fact that EBA outperformed BTL supports the idea that people living with diabetes may weigh specific features, like emotional reassurance or

physical comfort, differently depending on the choice at hand. This has important implications for how patient preferences are captured and understood in research and product development.

Subgroup Insights

Beyond the overall preference patterns observed across all participants, segmentation offers the opportunity to uncover differences in how specific subgroups prioritize various aspects of diabetes treatment. Understanding such variations can support more tailored strategies in product development and communication. To explore this potential, subgroup analyses were conducted across four dimensions: medication type, country of residence, time since diagnosis and age ranges. These subgroup comparisons aim to reveal whether the relative importance of treatment aspects, such as emotional support, treatment confidence, or physical comfort, varies in meaningful ways across different patient experiences and contexts.

GLP-1 Users Only

The first segmentation focused on individuals using GLP-1 receptor agonists. By isolating this group, the analysis aimed to determine whether their preferences were shaped by specific treatment experiences.

Using the same Elimination by Aspects (EBA) modeling approach, aspect weights were re-estimated for this subgroup. As shown in Figure 5.1, **Treatment Confidence** remained the most influential factor, closely followed by **Emotional Aspects** and **Time Efficiency**.
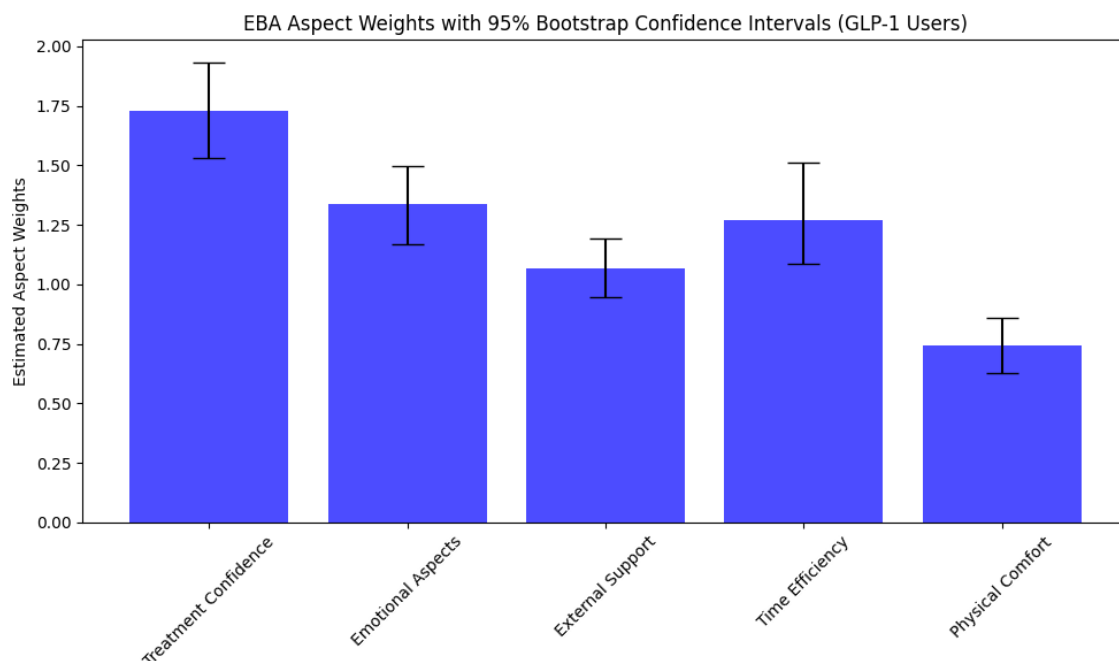

Figure 5.1. EBA aspect weights with 95% confidence intervals for GLP-1 users only.

While the relative ranking of aspects mirrored the full-sample model, their estimated weights were more differentiated. For instance, **External Support** carried less weight among GLP-1 users,

possibly reflecting greater independence or confidence in managing their regimen. Similarly, **Physical Comfort** remained the least influential factor, suggesting that discomfort or pain may be secondary to broader concerns about treatment control and emotional well-being. These findings suggest that while general preference trends persist, subtle shifts in the strength of preference dimensions may emerge based on treatment type.

Comparison by Country

To investigate whether treatment preferences vary across geographic regions, the Elimination by Aspects (EBA) model was applied separately for each country represented in the sample: the United States (US), United Kingdom (UK), Germany, and Canada. The resulting aspect weights, along with 95% bootstrap confidence intervals, are presented in Figure 5.2.
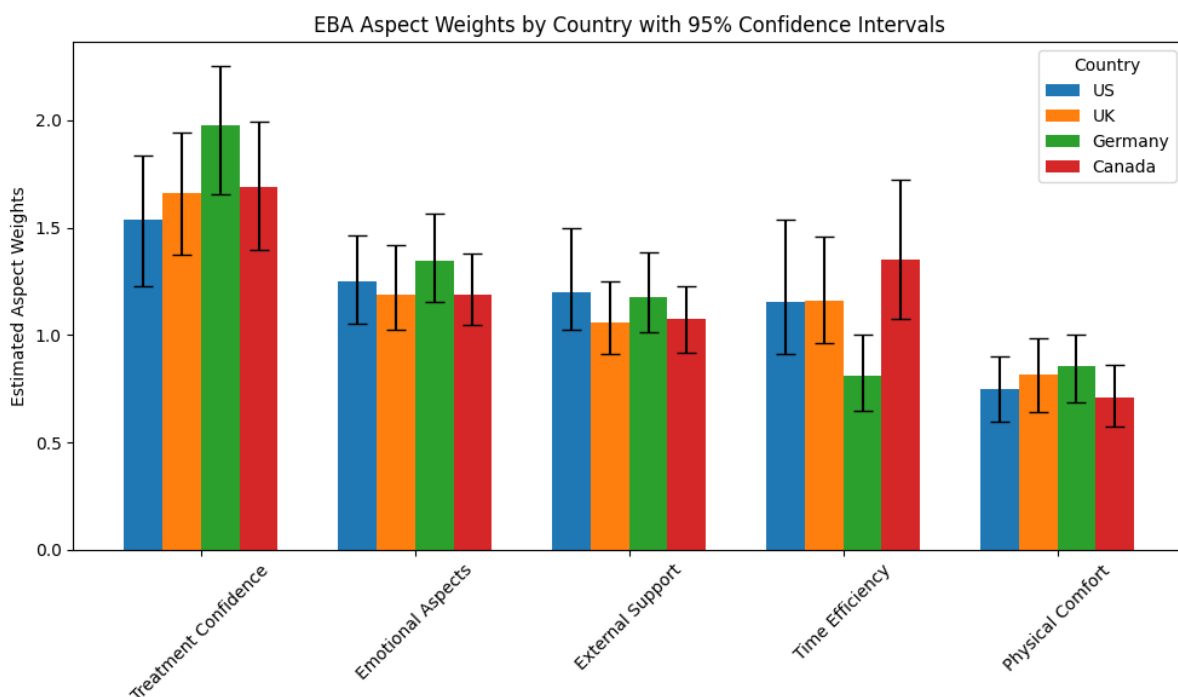

Figure 5.2. EBA aspect weights with 95% confidence intervals segmented by country.

Across all four countries, **Treatment Confidence** emerged as the most influential aspect, with Germany showing the highest weight for this factor. This indicates a strong, shared emphasis on trust and clarity in treatment delivery across the sample, particularly among German respondents.

Emotional Aspects and **External Support** received relatively consistent weights across countries, with minor variation. UK and Canada participants placed slightly less emphasis on Emotional Aspects, while German participants showed a modestly higher valuation of this dimension.

Differences became more pronounced for **Time Efficiency**. Participants from Canada rated this aspect significantly higher than their counterparts in Germany. This may reflect differing healthcare routines or expectations surrounding treatment convenience across national systems.

Finally, **Physical Comfort** was the least influential aspect in all four countries, though Canada and the US exhibited slightly lower scores compared to Germany and the UK. These consistently lower weights suggest that while discomfort may be a concern, it does not strongly drive preference decisions relative to other factors.

Taken together, these findings indicate that although general trends in aspect importance are preserved across regions, subtle cross-national variations may reflect contextual differences in healthcare systems, patient expectations, or cultural attitudes toward treatment management.

Comparison by Time Since Diagnosis

In addition to geographic segmentation, participants were grouped based on how long they had been living with diabetes. The goal was to explore whether the importance assigned to different treatment aspects shifts throughout the course of patients' experiences. Participants were categorized into five diagnostic timeframes: less than 1 year, 1–3 years, 4–6 years, 7–15 years, and more than 15 years.

Figure 5.3 shows the EBA-estimated aspect weights for each group, along with 95% confidence intervals.
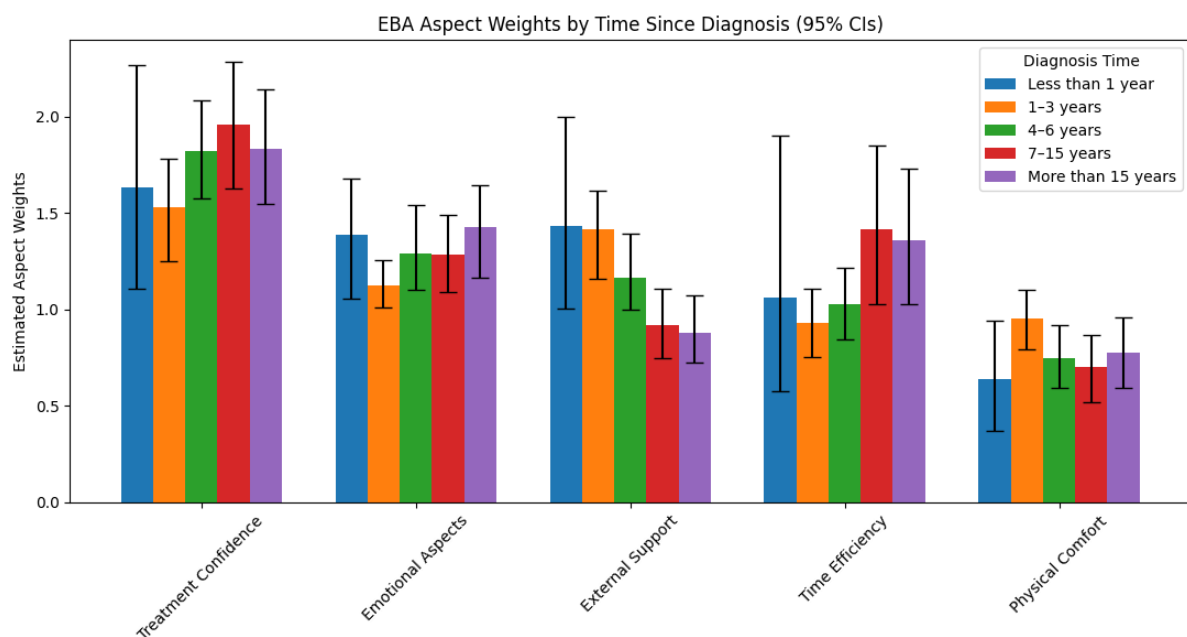

Figure 5.3. EBA aspect weights with 95% confidence intervals by time since diagnosis.

Participants diagnosed **less than one year ago** placed greatest weight on **Treatment Confidence**, followed by **External Support** and **Emotional Aspects**, which received nearly equal weight. This suggests that early in the diagnosis journey, patients are especially focused on gaining confidence in their treatment and value strong support systems, both practical and emotional, as they adapt to their new routines.

Among those diagnosed for **1–3 years**, the results reflect a continued emphasis on **Treatment Confidence**, but here **External Support** is weighted nearly as strongly. This may indicate

that while initial emotional needs may begin to stabilize, respondents in this stage still rely heavily on external support and reassurance in managing their treatment.

For the **4–6 year** group, **Treatment Confidence** stands out as the most valued aspect, receiving a significantly higher weight than the others. This may indicate a growing emphasis on trust in treatment during this stage of living with diabetes. **Emotional Aspects**, **External Support**, and **Time Efficiency** follow at similar but lower levels, suggesting a broader but secondary concern with well-being and practical support. *Physical Comfort* ranks lowest in this group.

Participants with **7–15 years** of experience displayed a clearer shift: **Treatment Confidence** emerged as the most dominant aspect, while **Time Efficiency** rose substantially in importance. Meanwhile, **External Support** dropped noticeably. These trends suggest that individuals in this stage may have developed strong routines and are more focused on efficiency and control rather than external guidance.

Finally, those living with diabetes for **more than 15 years** continued to prioritize **Treatment Confidence**, while also placing considerable weight on **Time Efficiency** and **Emotional Aspects**. This group assigned the lowest weight to **External Support** compared to other segments, which may suggest a growing sense of self-sufficiency over time. However, within the group, *Physical Comfort* was ranked as the least important aspect.

In summary, preferences evolve gradually with years since diagnosis. Patients earlier in their journey prioritize support and reassurance, while those further along place increasing value on autonomy, efficiency, and emotional resilience.

Comparison by Age Group

To examine how preferences varied across different stages of life, the dataset was segmented into four age groups: 18–24, 25–39, 40–59, and 60+, and the EBA model was applied separately to each subgroup. Figure 5.4 presents the estimated aspect weights for each age group, along with 95% confidence intervals.

Participants aged **18–24** placed the greatest emphasis on *Treatment Confidence* and *External Support*, suggesting a need for guidance and reassurance in managing their diabetes. *Emotional Aspects* and *Physical Comfort* were also valued, while *Time Efficiency* was rated lowest in this group,contrary to the general trend, where *Physical Comfort* ranked last. This may indicate that younger adults prioritize support and confidence over convenience in their treatment experience.

Participants in the **25–39** group placed the highest value on *Treatment Confidence* and *External Support*, followed closely by *Emotional Aspects*. This suggests that while confidence in treatment remains central, external encouragement and emotional well-being also play a strong role in shaping preferences. *Physical Comfort* was rated lowest in this group, indicating a lower priority placed on physical ease compared to psychological and social factors.

In the **40–59** age group, *Treatment Confidence* remained the highest-rated aspect, followed by *Emotional Aspects* and then *External Support*. This pattern is similar to that of the 25–39 group, though with a slightly stronger emphasis on emotional well-being. *Time Efficiency* and *Physical*

Comfort were ranked lower, with the latter receiving the least weight.

Among participants aged **60 and above**, *Treatment Confidence* had the highest weight of all groups, and *Time Efficiency* also saw a notable increase. This may reflect a desire for routines that are not only trustworthy but also easy to manage. In contrast, *External Support* and *Physical Comfort* were rated lower, suggesting greater independence and tolerance for physical discomfort if confidence in treatment is high.

These age-based patterns suggest that while some aspects—like treatment confidence—are consistently important, the strength of preference for emotional, supportive, or practical concerns shifts over the life course.
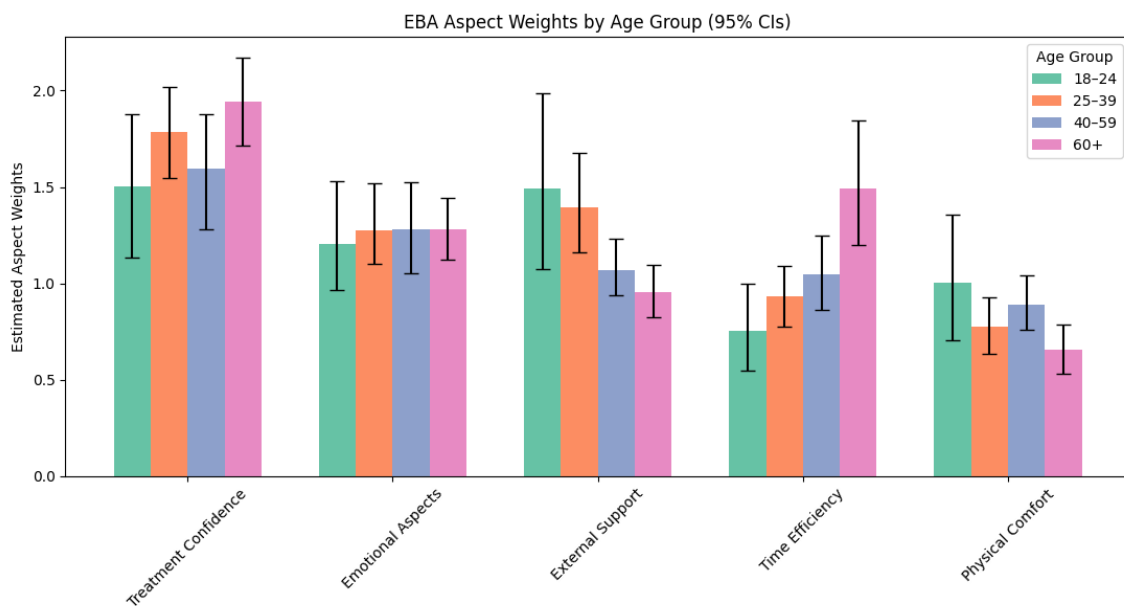

Figure 5.4. EBA aspect weights with 95% confidence intervals segmented by age group.

Response Quality and Behavioral Patterns

In addition to the main analytical procedures, a complementary analysis was conducted to assess potential response biases that may have influenced participant behavior during the survey.

Figure 5.5 presents a Random Forest feature importance plot, showing the relative influence of different variables on participants' responses in the pairwise choice tasks. Notably, the positions of the presented value propositions, specifically whether an option appeared first (Object1) or second (Object2), emerged as two of the strongest predictors of choice. Although the pairwise comparisons were counterbalanced to avoid systematic ordering effects, the data indicate a substantial positional bias. Specifically, **14 participants selected the first-listed value proposition in all 15 of their comparisons**, while **2 participants consistently chose the second-listed option**. These behaviors suggest non-deliberative responding, potentially reflecting inattention or disengagement.
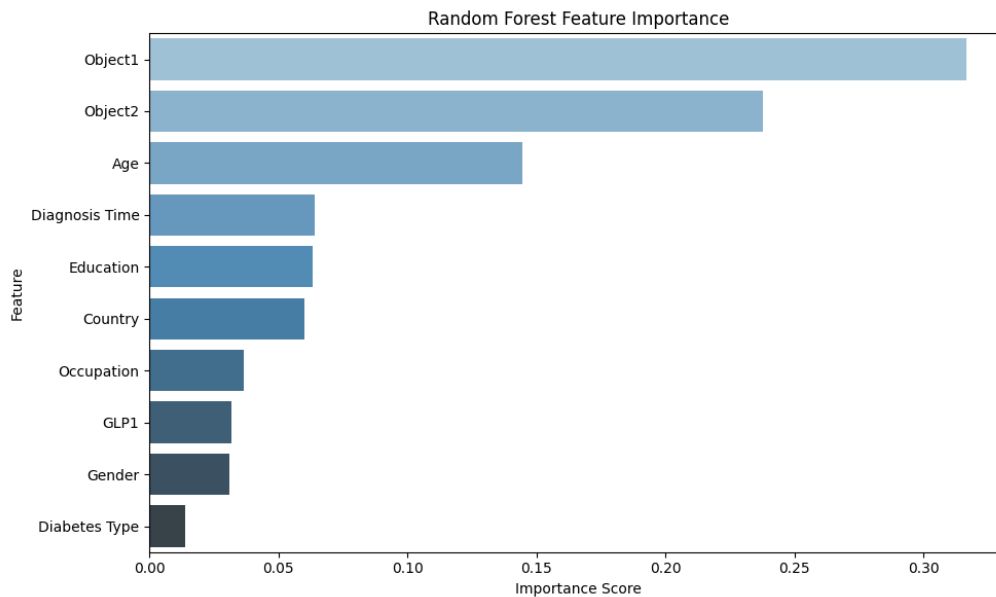
Figure 5.5. Random Forest feature importance scores for predicting participant responses. Object1 and Object2 represent the positions of value propositions shown on screen in each comparison.

This bias did not influence the results of the paired comparison models, as participants with high levels of inconsistency (more than 30% circular triads) were excluded from the BTL and EBA analyses. However, such biases may still have affected other parts of the study.

The short median completion time of **7 minutes and 37 seconds** for a cognitively demanding survey and the exclusion of **84 participants (22%)** due to logical inconsistency raise concerns about overall response quality. In future studies, data quality can be improved by implementing exclusion criteria based on minimum response time or flagging participants who display repetitive patterns, such as always selecting the same position.

Limitations and Future Directions

This study provides insights into how people with diabetes prioritize treatment options, but several limitations should be noted. The ten value propositions were developed by a single individual without input from patients or healthcare professionals, which may affect their relevance and clarity. Future research should involve participatory design, engaging both patients and experts, and use pretesting methods like cognitive interviews to ensure the propositions are meaningful and distinct. The dataset was limited to participants who met a logical consistency threshold, which improved data quality but reduced the sample size. Additionally, patterns of order effects suggest that not all participants responded thoughtfully. To address this, future studies should incorporate attention checks, response time filters, and logging of survey behavior. While the EBA model outperformed BTL in explaining preferences, further exploration of models such as Preference Trees or Hierarchical Bayes could offer improved interpretability. Mixed modeling approaches may also help uncover individual differences and hidden subgroups in decision-making patterns.

Conclusion 6

This project set out to identify and prioritize what people living with diabetes consider valuable in their treatments. It was based on the assumption that treatment outcomes should be evaluated from the perspective of the user, and that a deeper understanding of user needs can inform better product development.

The first part of the project focused on analyzing qualitative data from three studies conducted by Novo Nordisk in different cultural and healthcare settings. These studies were used to identify recurring themes in how diabetes impacts daily life. A thematic analysis process led to the development of user needs, which were then reformulated as value propositions written in the first person to help users relate to them more easily. The value propositions were refined through a participatory workshop involving stakeholders from Novo Nordisk.

A pairwise comparison method was chosen to measure user priorities, allowing participants to evaluate two value propositions at a time. An online survey was distributed to participants in four different countries with a total of 395 responses collected. The analysis used the Bradley-Terry-Luce and Elimination by Aspects models to estimate the relative importance of each value proposition. The BTL results showed that *"I trust that my diabetes treatment is safe and reliable"* received the highest preference score across the participants.

Several limitations were identified. The phrasing of value propositions was developed by a single individual without direct involvement of people with diabetes or healthcare professionals, which may have introduced bias. While reliability checks were applied to improve data quality, they also reduced the sample size. Patterns suggesting order effects were observed in some participants' responses, which could have influenced the results.

Despite these limitations, the project demonstrates a practical approach to translating qualitative insights into measurable priorities. It combines thematic analysis, value proposition design, and choice modeling to create a structured method for capturing user-defined value. The findings can support product teams in aligning development efforts with the aspects of treatment that matter most to users. Future research can build on this by involving users more directly in the design process, applying additional models, and validating the value propositions in clinical or real-world settings.

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Appendices

I   Appendix I - Themes and insights from the three studies

First Study: Generative Design Research

1. *Challenges with Diabetes Management*

   - BG measurements define success or failure in self-management.
   - The BG meter is central to diabetes management.
   - Unclear BG readings cause frustration and fear, making self-management difficult.
   - Delayed treatment is perceived as postponing rather than non-adherence.

2. *Data & Data Recording*

   - Recorded data is difficult to interpret without HCP guidance.
   - HCP recommendations are followed closely, with little confidence in making independent treatment adjustments.
   - Data sharing with HCPs lacks standardization, creating inefficiencies.
   - The process of sharing and using data remains unclear and cumbersome.

3. *Hygiene*

   - Insulin pens are designed to be hygienic, with concerns focused on needle use rather than the pen itself.
   - The pen case reassures users that their device remains clean and protected.
   - Needle-changing routines vary.
   - There is no strong concern about hygiene among those who change needles infrequently.

4. *Durability*

   - Prefilled pens are seen as more wasteful than durable pens.
   - Environmental awareness influences preference for durable pens.
   - Reusable or recyclable pens are perceived as the less wasteful option.
   - Medical waste disposal is a challenge due to recycling barriers.

5. *Wastefulness*

   - Material (metal/plastic) is not associated with durability.
   - Robustness is trusted regardless of material.
   - No strong personal attachment exists to either prefilled or durable pens.
   - Both pen types perform equally well in terms of functionality.
   - Cartridge replacement does not impact the perceived ease of use of durable pens.

Second Study: Research of Glucagon-Like Peptide-1 (GLP-1)

1. *The Disconnect Between Treatment & Everyday Life*

   - Structured diabetes management conflicts with social life, making adherence difficult.
   - HbA1c and BG levels are hard to use as active drivers for behaviour in daily life.
   - Rigid treatment guidelines are difficult to apply in real-life situations despite knowledge of what to do.

2. *Blood Glucose (BG) Monitoring as a Source of Emotional Stress*

   - BG levels serve as a status check rather than a proactive decision-making tool.
   - Unexplained BG fluctuations cause stress and loss of motivation.
   - High BG readings trigger stress eating and unhealthy coping mechanisms.
   - BG monitoring is emotionally taxing due to fear of negative results.

3. *The Role of Social Support*

- Self-management often leads to isolation.
- Close friends and family may not fully understand the challenges of diabetes management.
- Strong social support improves treatment adherence and emotional well-being.
- Online communities provide some support but lack real-world emotional backing.

4. *The Psychological Impact of Not Reaching Goals*

- Failing to meet HbA1c/BG goals leads to frustration, guilt, and disengagement.
- Weight gain and high BG readings create a cycle of self-doubt and poor management.
- Emotional relief is often sought through food, making self-control harder.

5. *The Need for Structured Transitions in Diabetes Management*

- Transitioning to diabetes management requires major lifestyle adjustments.
- Lack of structured support makes adherence difficult.
- HCPs can act as motivators, but personal relationships with them are important.

6. *The Role of Self-Reflection and Goal-Setting*

- Self-reflection helps integrate diabetes management into daily routines.
- Small, achievable goals foster motivation and control.
- Planning and gradual lifestyle changes reduce the burden of self-management.

7. *The Burden of Self-Management and the Need for Accountability*

- Managing diabetes alone is mentally exhausting.
- Lack of a support system increases mental burden.
- Sharing goals with family or an HCP eases the responsibility of self-management.

Third Study: Living with Diabetes In India

1. *Cultural & Religious Influences on Diabetes Management*

- Fasting and traditional food habits conflict with structured diabetes control.
- Alternative medicine is widely used, sometimes replacing medical treatment.
- HCPs tolerate alternative treatments to maintain patient trust.

2. *Gender Roles and Family Responsibilities*

- Women take responsibility for managing male family members' diabetes
- Women receive less support when they are the ones affected.
- Household duties take priority over self-care, affecting adherence.

3. *Social Stigma and Hidden Diabetes*

- Fear of harming marriage prospects leads to hiding diabetes status.
- Insulin injections in public are avoided due to embarrassment.
- Stigma prevents timely treatment and disclosure of diabetes status.

4. *Limited Understanding of Diabetes and Late Diagnosis*

- Sugar consumption is widely believed to be the sole cause of diabetes.
- Diagnosis often occurs late, once severe symptoms appear.

5. *Financial Barriers to Diabetes Management*

- Treatment is an out-of-pocket expense, limiting access to care.
- Cost concerns lead to switching from insulin pens to cheaper alternatives like vials and syringes.

6. *Psychological Burden of Diabetes & Self-Management Stress*

- Diabetes is perceived as a condition that has taken over daily life, making self-care overwhelming.

- Stress leads to fatigue and treatment neglect.

7. *Perception of Pen Injectors in Diabetes Management*

   - Pen injectors are perceived as more convenient and less painful than alternatives.
   - Cost concerns prevent some from switching to insulin pens.

8. *Challenges with Pen Usage and Administration*

   - Fear of incorrect dosing and unknowingly using an empty cartridge creates anxiety.
   - HCPs worry about misadministration among those with low literacy.

9. *Durability and Practicality of Insulin Pens*

   - The durability of reusable insulin pens is appreciated
   - There are concerns about malfunctions in insulin pens.
   - Safe transportation and temperature control are challenges.

10. *Economic Constraints Affecting Pen Adoption*

    - Insulin pens are perceived as more expensive over time.
    - Despite a preference for pens, some switch back to syringes due to cost.

11. *Need for Improved Training and Instructions*

    - HCPs require detailed training before confidently recommending insulin pens.
    - QR codes, video demonstrations, and step-by-step guides are needed.

12. *DuraTouch Feedback and Design Perception*

    - DuraTouch is considered easy to use, with a smooth dose adjustment mechanism.
    - HCPs raise concerns about ensuring proper insulin delivery and dosage accuracy.

II Appendix II - BG Monitoring & Emotional Stress

<Files Data> - § 11 references coded [12,10% Coverage]

Reference 1 - 0,95% Coverage

BG measurements define success or failure in self-management.

Reference 2 - 0,73% Coverage

The BG meter is central to diabetes management.

Reference 3 - 1,26% Coverage

Unclear BG readings cause frustration and fear, making self-management difficult.

Reference 4 - 1,11% Coverage

Delayed treatment is perceived as postponing rather than non-adherence.

Reference 5 - 1,23% Coverage

BG levels serve as a status check rather than a proactive decision-making tool.

Reference 6 - 1,00% Coverage

Unexplained BG fluctuations cause stress and loss of motivation.

Reference 7 - 1,11% Coverage

High BG readings trigger stress eating and unhealthy coping mechanisms.

Reference 8 - 1,06% Coverage

BG monitoring is emotionally taxing due to fear of negative results.

Reference 9 - 1,22% Coverage

Failing to meet HbA1c/BG goals leads to frustration, guilt, and disengagement.

Reference 10 - 1,28% Coverage

Weight gain and high BG readings create a cycle of self-doubt and poor management.

Reference 11 - 1,15% Coverage

Emotional relief is often sought through food, making self-control harder.

III   Appendix III - Cost & Accessibility

<Files

Data> - § 4 references coded [4,49% Coverage]

Reference 1 - 0,98% Coverage

Treatment is an out-of-pocket expense, limiting access to care. % Coverage

Cost concerns lead to switching from insulin pens to cheaper alternatives like vials and syringes.

Reference 3 - 0,86% Coverage

Insulin pens are perceived as more expensive over time.

Reference 4 - 1,12% Coverage

Despite a preference for pens, some switch back to syringes due to cost.

IV   Appendix IV - Data & Data Recording

<Files
Data> - § 4 references coded [4,82

Reference 1 - 0,95

Recorded data is difficult to interpret without HCP guidance.

Reference 2 - 1,70

HCP recommendations are followed closely, with little confidence in making independent treatment adjustments.

Reference 3 - 1,09

Data sharing with HCPs lacks standardization, creating inefficiencies.

Reference 4 - 1,08

The process of sharing and using data remains unclear and cumbersome.

V Appendix V - Device Durability & Wastefulness

<Files
Data> - § 12 references coded [11,57% Coverage]

Reference 1 - 0,92% Coverage

Prefilled pens are seen as more wasteful than durable pens.

Reference 2 - 0,98% Coverage

Environmental awareness influences preference for durable pens.

Reference 3 - 1,09% Coverage

Reusable or recyclable pens are perceived as the less wasteful option.

Reference 4 - 1,00% Coverage

Medical waste disposal is a challenge due to recycling barriers.

Reference 5 - 0,92% Coverage

Material (metal/plastic) is not associated with durability.

Reference 6 - 0,70% Coverage

Robustness is trusted regardless of material.

Reference 7 - 1,14% Coverage

No strong personal attachment exists to either prefilled or durable pens.

Reference 8 - 0,97% Coverage

Both pen types perform equally well in terms of functionality.

Reference 9 - 1,25% Coverage

Cartridge replacement does not impact the perceived ease of use of durable pens.

Reference 10 - 0,84% Coverage

The durability of reusable insulin pens is appreciated

VI   Appendix VI - Hygiene

<Files

Data> - § 4 references coded [4,60% Coverage] Reference 1 - 1,64% Coverage

Insulin pens are designed to be hygienic, with concerns focused on needle use rather than the pen itself.

Reference 2 - 1,17% Coverage

The pen case reassures users that their device remains clean and protected.

Reference 3 - 0,47% Coverage

Needle-changing routines vary.

Reference 4 - 1,33% Coverage

There is no strong concern about hygiene among those who change needles infrequently.

VII   Appendix VII - Lifestyle Conflicts

<Files
Data> - § 6 references coded [6,41% Coverage]

Reference 1 - 1,22% Coverage

Fasting and traditional food habits conflict with structured diabetes control.

Reference 2 - 1,17% Coverage

Alternative medicine is widely used, sometimes replacing medical treatment.

Reference 3 - 0,98% Coverage

HCPs tolerate alternative treatments to maintain patient trust.

Reference 4 - 1,08% Coverage

Women take responsibility for managing male family members' diabetes

Reference 5 - 0,92% Coverage

Women receive less support when they are the ones affected.

Reference 6 - 1,04% Coverage

Household duties take priority over self-care, affecting adherence.

VIII   Appendix VIII - Need for Better education

Files Data> - § 4 references coded [4,21% Coverage]

Reference 1 - 1,09% Coverage

Sugar consumption is widely believed to be the sole cause of diabetes.

Reference 2 - 0,89% Coverage

Diagnosis often occurs late, once severe symptoms appear.

Reference 3 - 1,19% Coverage

HCPs require detailed training before confidently recommending insulin pens.

Reference 4 - 1,04% Coverage

QR codes, video demonstrations, and step-by-step guides are needed.

IX   Appendix IX - Pen Usability& Data Administration

<Files

Data> - § 5 references coded [6,91% Coverage]

Reference 1 - 1,28% Coverage

Pen injectors are perceived as more convenient and less painful than alternatives.

Reference 2 - 1,28% Coverage

Fear of incorrect dosing and unknowingly using an empty cartridge creates anxiety.

Reference 3 - 1,01% Coverage

HCPs worry about misadministration among those with low literacy.

Reference 4 - 1,20% Coverage

DuraTouch is considered easy to use, with a smooth dose adjustment mechanism.

Reference 5 - 1,23% Coverage

HCPs raise concerns about ensuring proper insulin delivery and dosage accuracy.

X   Appendix X - Social Support & Stigma

<Files Data> - § 7 references coded [7,47% Coverage]

Reference 1 - 0,64% Coverage

Self-management often leads to isolation.

Reference 2 - 1,37% Coverage

Close friends and family may not fully understand the challenges of diabetes management.

Reference 3 - 1,19% Coverage

Strong social support improves treatment adherence and emotional well-being.

Reference 4 - 1,22% Coverage

Online communities provide some support but lack real-world emotional backing.

Reference 5 - 1,04% Coverage

Fear of harming marriage prospects leads to hiding diabetes status.

Reference 6 - 0,97% Coverage

Insulin injections in public are avoided due to embarrassment.

Reference 7 - 1,04% Coverage

Stigma prevents timely treatment and disclosure of diabetes status.

XI Appendix XI - Transition & Goal-Setting Support

<Files
Data> - § 14 references coded [15,64% Coverage]

Reference 1 - 1,34% Coverage

Structured diabetes management conflicts with social life, making adherence difficult.

Reference 2 - 1,28% Coverage

HbA1c and BG levels are hard to use as active drivers for behaviour in daily life.

Reference 3 - 1,65% Coverage

Rigid treatment guidelines are difficult to apply in real-life situations despite knowledge of what to do.

Reference 4 - 1,15% Coverage

Transitioning to diabetes management requires major lifestyle adjustments.

Reference 5 - 0,83% Coverage

Lack of structured support makes adherence difficult.

Reference 6 - 1,23% Coverage

HCPs can act as motivators, but personal relationships with them are important.

Reference 7 - 1,12% Coverage

Self-reflection helps integrate diabetes management into daily routines.

Reference 8 - 0,84% Coverage

Small, achievable goals foster motivation and control.

Reference 9 - 1,19% Coverage

Planning and gradual lifestyle changes reduce the burden of self-management.

Reference 10 - 0,73% Coverage

Managing diabetes alone is mentally exhausting.

Reference 11 - 0,76% Coverage

Lack of a support system increases mental burden.

Reference 12 - 1,25% Coverage

Sharing goals with family or an HCP eases the responsibility of self-management.

Reference 13 - 1,54% Coverage

Diabetes is perceived as a condition that has taken over daily life, making self-care overwhelming.

Reference 14 - 0,72% Coverage

Stress leads to fatigue and treatment neglect.

XII   Appendix XII

- Initial 19 Value Propositions

1. To have control over my diabetes.
2. To have the freedom to live my life beside my diabetes.
3. To manage my diabetes without worrying about the cost.
4. To better understand my diabetes.
5. To feel confident making decisions about my diabetes.
6. To communicate easily with my healthcare provider.
7. To simplify my treatment routine.
8. To trust that my diabetes treatment is reliable.
9. To manage my treatment easily.
10. To feel safe with my treatment.
11. To feel that diabetes is understood and taken seriously by others.
12. To trust that my healthcare provider understands my individual needs.
13. To manage my diabetes with as little pain as possible.
14. To be sure I am getting the right amount of medicine.
15. To feel emotionally supported and understood by the people around me.
16. To get support when adapting to life with diabetes.
17. To feel optimistic about my future with diabetes.
18. To feel that the effort I put into managing my diabetes is valued.
19. To feel emotionally strong while living with diabetes.

XIII   Appendix XIII

- Value Proposition Extraction

Insight 1

BG readings are perceived as indicators of personal success or failure rather than as tools for proactive treatment planning. Instead of being used as tools for planning and adjustment, they may contribute to feelings of judgment, guilt, or discouragement.

Customer Profile

Job to be done:

- To track and interpret blood glucose (BG) data as part of daily self-management. This includes:
    - Monitoring BG levels multiple times a day.
    - Comparing readings with expected targets.
    - Maintaining daily stability and long-term health.
    - Trying to identify causes of high or low values.
    - Deciding how to adjust food, medication, or activity based on the data.

Pain Points:

- BG fluctuations feel unpredictable and hard to interpret.
- Even when following treatment plans, readings may not make sense.
- Emotional impact includes frustration, guilt, and reduced confidence.
- Difficulty knowing what to adjust or change in response.

Gains:

- To confidently interpret what the data means.
- To take action without second-guessing every choice.
- To feel informed and supported, rather than judged.
- To use data as a guide for self-management and stability.

Value Map

Pain Reliever:

- A solution that explains variability, reduces feelings of failure, and normalizes fluctuations, helping individuals feel less judged by the numbers.

Gain Creator:

- Turns data into practical guidance.
- Helps users build confidence and a sense of self-agency.
- Supports learning and decision making over time.

Products or Services:

- The solution could include content, tracking tools, visualizations, behavioral nudges, or decision support features that help people understand their patterns and feel supported in acting on them.

Resulting Value Proposition

To have control over my diabetes.

Insight 2

Unclear or fluctuating BG readings create stress and confusion, making self-management more difficult.
This insight can be included in the first value proposition, **To have control over my diabetes**, as it addresses the same underlying need. The emotional impact of unpredictable or confusing blood glucose levels contributes directly to the feeling of losing control. Rather than reflecting a separate user need, this insight reinforces the importance of clarity and stability as part of the broader desire to feel in control of one's condition.

Insight 3

High BG readings often lead to emotional eating or other unhealthy coping strategies.
This insight can also be included in the first value proposition, as it highlights a consequence of losing that sense of control. When blood glucose levels feel unmanageable or emotionally overwhelming, it can trigger reactive behaviors that further complicate self-management.

Insight 4

Failing to reach BG or HbA1c goals causes guilt and disengagement.

This insight can be included in the first value proposition, as it speaks to the emotional toll of perceived failure in diabetes self-management. When individuals feel they are not meeting expected targets, it can undermine their sense of agency and lead to withdrawal from active engagement. The core need remains the same: to feel in control in managing one's condition day to day.

Insight 5

Delayed treatment is perceived as postponing rather than non-adherence.

Customer Profile

Job to be done:

- To follow the prescribed diabetes treatment while balancing the demands of daily life. This includes:
  - Keeping track of treatment that often disrupts daily life.
  - Taking medication on time, even when it interrupts routines or social moments.

– Fitting injections or doses into unpredictable daily schedules.
– Adapt life to treatment, not the other way around.

Pains:

- Feeling like daily life is dictated by diabetes.
- Guilt or anxiety for missing exact dosing times.
- Emotional burden of always having to prioritize treatment.
- Lack of freedom or spontaneity.

Gains:

- Flexibility to adjust treatment when needed.
- Freedom to live without constant reminders of the condition.
- A sense of normality and autonomy.

Value Map

Pain Reliever:

- Removes guilt and pressure by framing treatment as adaptable rather than rigid. Supports emotional well-being by normalizing small delays or adjustments.

Gain Creator:

- Empowers users to take ownership of their condition while maintaining quality of life.
- Encourages adherence to sustainable treatment through trust and flexibility.

Products or Services:

- Could include decision support tools with flexible dosing options, educational content that encourages responsible autonomy, or communication strategies that validate user choice.

Resulting Value Proposition

To have the freedom to live my life beside my diabetes.

Insight 6

Treatment is an out-of-pocket expense, limiting access to care.

Customer Profile

Job to be done:

- To manage diabetes while navigating financial barriers to treatment. This includes:
    - Paying for medication, devices, or supplies.
    - Comparing costs between treatment options.
    - Deciding whether to delay, skip, or adjust treatment due to affordability.

Pains:

- Worrying about being able to afford ongoing medication or supplies.
- Stress about choosing between treatment and other essential expenses.
- Feeling shame or fear about not following the plan due to cost.
- Anxiety about long-term consequences of inconsistent treatment.

Gains:

- Consistent access to the treatment they need.
- Peace of mind knowing they can afford their care.
- Ability to focus on health without constant financial stress.
- A sense of security and stability in managing their condition.

Value Map

Pain Reliever:

- Reduces or eliminates the emotional and financial stress caused by uncertainty or lack of access.
- Helps people with diabetes feel supported, not punished, when navigating cost related decisions.

Gain Creator:

- Promotes a sense of security and equity by ensuring that access to care is not dependent on income.
- Helps individuals feel supported in their treatment journey, regardless of their financial situation.
- Allows them to focus on managing their condition rather than stressing about the cost.

Products or Services:

- Solutions may include financial assistance programs and communication strategies that are transparent, respectful, and sensitive to cost related concerns.

Resulting Value Proposition

To manage my diabetes without worrying about the cost.

Insight 7

Due to cost concerns, some patients switch from insulin pens to cheaper alternatives like vials and syringes, even if they prefer pens.

This insight can be included in the previous value proposition, **To manage my diabetes without worrying about the cost**, as it reflects the same underlying issue: financial limitations shaping treatment decisions. In this case, people are not choosing what works best for them, but what they can afford — even if it means compromising comfort, convenience, or confidence. The insight reinforces the need for affordable access to preferred treatment options, and the desire to make decisions based on personal needs, not cost constraints.

Insight 8

Insulin pens are perceived as more expensive over time.

This insight can also be included in the value proposition **To manage my diabetes without worrying about the cost**, as it highlights how long-term financial concerns influence perceptions of treatment options. Even when insulin pens are preferred for their ease of use, they may be seen as financially unsustainable in the long run. This reinforces the broader emotional and practical burden of affordability, and the need for treatment options that people can rely on, both now and over time, without cost becoming a barrier.

Insight 9

Recorded data is difficult to interpret without HCP guidance.

Customer Profile

Job to be done:

- To collect and make sense of diabetes-related data in daily life. This includes:
  - Logging blood glucose readings, food intake, activity, and medication.
  - Trying to understand fluctuations and what caused them.
  - Figuring out how to adjust behavior or treatment based on the data.

Pains:

- Confusion about patterns or fluctuations.
- Feeling unsure about what actions to take.
- Frustration after logging consistently with little insight.
- Reliance on external explanations or validation.

Gains:

- To feel capable of interpreting personal data.
- To make decisions with more confidence.
- To engage in daily management with clarity and understanding.
- To feel less dependent on external input for basic insights.

Value Map

Pain Reliever:

- Helps translate raw data into meaningful insights, reducing confusion and second-guessing.

Gain Creator:

- Empowers users to recognize patterns, feel more confident, and take meaningful action without constant outside interpretation.

Products or Services:

- Could include user-friendly tracking tools, visualizations, or educational content that helps explain how different factors interact, supporting learning and self-trust over time.

Resulting Value Proposition

To better understand my diabetes.

Insight 10

HCP recommendations are followed closely, with little confidence in making independent treatment adjustments.

Customer Profile

Job to be done:

- To apply healthcare provider recommendations in real-life situations, while navigating uncertainty about when or how to make adjustments. This includes:
  - Following prescribed treatment plans in daily routines.
  - Facing unexpected situations where decisions must be made independently.
  - Deciding whether and how to adjust insulin, food, or activity in response to changes.
  - Balancing adherence with the need for real-time flexibility.

Pains:

- Fear of making a mistake or doing harm.
- Lack of clarity about personal boundaries for adjustment.
- Reliance on medical professionals for reassurance.
- Hesitation to act, even when action is needed.

Gains:

- Confidence in interpreting and acting on personal health data.
- Flexibility to adapt care plans when necessary.
- Feeling like an informed, capable partner in their care, not just a follower of instructions.

Value Map

Pain Reliever:

- Reduces the fear of doing something wrong and clarifies what kinds of adjustments are safe and appropriate.
- Replaces dependence with empowerment.

Gain Creator:

- Builds trust in one's own knowledge and ability to make good decisions.
- Encourages skill-building, autonomy, and ownership of care routines.

Products or Services:

- Could include tools for guided decision-making, educational content about when and how to adjust treatment, or supportive messaging from HCPs that promotes shared responsibility and patient confidence.

Resulting Value Proposition

To feel confident making decisions about my diabetes.

Insight 11

Data sharing with HCPs lacks standardization, creating inefficiencies.

Customer Profile

Job to be done:

- To share relevant diabetes-related data with healthcare professionals in a way that supports efficient and informed care. This includes:
    - Exporting or transferring data from devices or apps.
    - Organizing and preparing data for review.
    - Ensuring HCPs receive the information in time and in the right format.
    - Following up when data is missed, misread, or not integrated into care.

Pains:

- Lack of standardized or integrated platforms for sharing data.
- Repetitive or manual processes that waste time.
- Uncertainty about whether data has been received or reviewed.
- Delays or inefficiencies in getting meaningful feedback.

Gains:

- A streamlined process for data sharing.
- Clarity on what is shared and how it's used in care.
- A more productive, data-informed relationship with the healthcare provider.

Value Map

Pain Reliever:

- Helps avoid confusion and wasted time by making sure systems work well together and the process for sharing data is clear for both patients and healthcare providers.

Gain Creator:

- Promotes seamless communication and more responsive care.
- Supports timely feedback and shared decision-making.

Products or Services:

- This could include tools that help patients and healthcare providers easily share data, like connected apps, automatic syncing from devices, or easy-to-read reports that show the full picture.

Resulting Value Proposition

To communicate easily with my healthcare provider.

Insight 12

The process of sharing and using data remains unclear and cumbersome.

This insight can be included in the value proposition **To communicate easily with my healthcare provider**, as it highlights the same core issue: a lack of clarity and simplicity in how patients and providers exchange and use diabetes-related information. When the process is difficult to follow or inconsistent, it creates unnecessary stress and makes appointments less effective, reinforcing the need for smoother, more intuitive communication between the patients and HCPs.

Insight 13

Prefilled pens are perceived as more wasteful than reusable or recyclable alternatives, which are preferred due to their durability and environmental benefits.

Customer Profile

Job to be done:

- To manage diabetes using tools and materials that generate physical and emotional workload. This includes:
  - Disposing of multiple single-use items as part of regular treatment.
  - Feeling responsible for sustainability while managing a demanding condition.
  - Navigating conflicting priorities between convenience and values.

Pains:

- Guilt or discomfort about generating waste.
- Emotional tension between doing what's easiest and what feels morally right.
- Frustration with packaging, excess materials, or disposal processes.
- A sense that diabetes care adds to environmental harm.

Gains:

- A simpler, more streamlined treatment experience.
- Fewer materials to handle or throw away.
- Relief from the guilt or moral discomfort around waste.

Value Map

Pain Reliever:

- Reduces the physical and emotional workload related to managing materials, packaging, and waste.

Gain Creator:

- Supports a sense of alignment between self-care and environmental values.
- Helps reduce moral fatigue and simplify the overall routine.

Products or Services:

- May include reusable or recyclable device formats, reduced packaging, clearer disposal options, or messaging that acknowledges environmental concerns and offers responsible alternatives.

Resulting Value Proposition

To simplify my treatment routine.

Insight 14

Medical waste disposal is a challenge due to recycling barriers.

This insight can be included in the value proposition **To simplify my treatment routine**, as it highlights another aspect of the practical and emotional burden tied to waste. When patients are unsure how to properly dispose of used materials, or when recycling options are limited or unclear, the routine becomes more complicated and frustrating. This adds to the sense that managing diabetes involves more than just treatment tasks, and supports the need for a simpler, more streamlined experience.

Insight 15

Carrying and using pens or other tools throughout the day, relying on devices to work properly regardless of material or brand, and managing potential stress around failure, leakage, or breakage.

Customer Profile

Job to be done:

- Carrying and using pens or other tools throughout the day.
- Relying on devices to work properly, regardless of material or brand.
- Managing potential stress around failure, leakage, or breakage.

Pains:

- Worry that the device may break or malfunction when needed.

- Uncertainty about whether the device is working correctly.
- Fear of being without a backup if the device fails during the day.

Gains:

- Confidence that the tool will work as expected.
- Simpler decision-making based on trust, not technical complexity.

Value Map

Pain Reliever:

- Reduces worry about device failure by reinforcing trust in its consistent performance.
- Gives users peace of mind that the tool will work as expected, every time.

Gain Creator:

- Reinforces user trust by focusing on what truly matters: reliable delivery and day-to-day dependability.

Products or Services:

- Treatment tools that perform consistently over time, even in varied conditions.
- Reliability is built through real-world use, where the device functions without failure and becomes a trusted part of daily care.

Resulting Value Proposition

To trust that my diabetes treatment is reliable.

Insight 16

Durable and prefilled pens are perceived as equally functional and easy to use.

Customer Profile

Job to be done:

- To carry out daily diabetes treatment using tools that are part of the routine. This includes:
    - Using pens or other devices to deliver medication.
    - Handling tools during everyday activities like work, meals, or travel.

Pains:

- Frustration with complicated or slow device interactions.
- Feeling like treatment adds unnecessary steps to an already full routine.
- Losing time or focus when dealing with difficult-to-use devices.

Gains:

- A faster, smoother treatment process.

- A sense of normality and ease.
- Devices that support, rather than interrupt, daily life.

Value Map

Pain Reliever:

- Eliminates unnecessary steps or complexity during treatment.
- Supports a routine that feels quick, light, and manageable.

Gain Creator:

- Frees up energy and attention for other things in life.
- Reinforces a sense of independence and simplicity.

Products or Services:

- Includes treatment tools that are intuitive, low-effort, and streamlined, allowing patients to take their medication easily and move on without delay or disruption.

Resulting Value Proposition

To manage my treatment easily.

Insight 17

Needle-changing routines vary, but infrequent changing is not generally linked to strong hygiene concerns.

Customer Profile

Job to be done:

- To use injection devices and needles as part of daily treatment. This includes:
    - Reusing or replacing needles depending on habit or convenience.
    - Balancing ease and routine with perceived hygiene or risk.
    - Using judgment to determine whether the treatment still feels safe.

Pains:

- Lack of clear feedback or consequences related to hygiene risks.
- Worry about infection, irritation, or complications.

Gains:

- Confidence that the treatment approach is safe.
- A sense of trust in their device and in their own practices.

Value Map

Pain Reliever:

- Helps patients understand when continued use of a needle may increase risk.
- Provides timely, supportive feedback that encourages needle-changing as part of a safe and sustainable routine.

Gain Creator:

- Promotes confidence and peace of mind by making the safe choice easy and routine.
- Reinforces a sense of responsibility and care, while helping users feel more in control of their treatment.

Products or Services:

- Could include devices with built-in usage tracking, visual or digital reminders to change the needle, or educational materials that clearly explain hygiene risks and the benefits of regular needle replacement.

Resulting Value Proposition

To feel safe with my treatment.

Insight 18

Users generally trust that insulin pens remain clean, especially when stored in protective cases.

This insight can be included in the value proposition **To feel safe with my treatment**, as it reinforces the underlying need for reassurance that daily treatment routines are hygienic and not putting users at risk. Trust in the cleanliness of devices, whether based on habit, design, or protective measures, supports the overall sense of safety in everyday care and aligns with the desire to avoid complications or harm.

Insight 19

Fasting and traditional food habits conflict with structured diabetes control.

This insight can be included in the value proposition **To have the freedom to live my life beside my diabetes**, as it highlights the tension between cultural or personal lifestyle choices and the structured demands of diabetes management. When individuals feel that their treatment plan limits participation in meaningful traditions or routines, it can reduce their sense of autonomy and connection to daily life. This reinforces the need for flexibility and freedom in managing diabetes in a way that respects the whole person — not just the condition.

Insight 20

Alternative medicine is frequently used alongside or instead of medical treatment and is often tolerated by HCPs to preserve patient trust.

This insight can be included in the value proposition **To feel confident making decisions about my diabetes**, as it reflects a deeper need for agency and self-direction. When people turn to alternative approaches, it may signal uncertainty or dissatisfaction with their role in standard treatment decisions. Supporting confidence through education, shared decision-making, and respectful dialogue can help patients feel more secure in their choices and reduce reliance on potentially unverified alternatives.

Insight 21

Lack of public awareness leads to misconceptions about diabetes and delayed diagnosis.

Customer Profile

Job to be done:

- To live with diabetes in a social context where the condition is often misunderstood. This includes:
    - Navigating public or family assumptions about what diabetes is or how it develops.
    - Responding to unsolicited comments or misinformation.
    - Feeling misunderstood or judged in everyday interactions.
    - Advocating for understanding without being reduced to stereotypes.

Pains:

- Frustration when others downplay the complexity of diabetes.
- Stigma linked to weight, injecting in public, or perceived self-blame.
- Delayed diagnosis due to low awareness of symptoms.

Gains:

- Recognition of diabetes as a complex and serious condition.
- Social empathy and informed support from others.
- Greater visibility that leads to earlier care and reduced stigma.

Value Map

Pain Reliever:

- Reduces stigma and emotional burden by increasing public understanding and shifting the narrative from blame to support.

Gain Creator:

- Fosters a sense of belonging and dignity by showing that the condition is understood and respected.
- Helps normalize diabetes as part of life, not as a personal failing.

Products or Services:

- Could include public education campaigns, awareness initiatives, inclusive health messaging, or tools that help individuals advocate for themselves and others in daily life.

Resulting Value Proposition

To feel that diabetes is understood and taken seriously by others.

Insight 22

Healthcare professionals require clear, structured training tools (videos, guides, QR codes) to confidently recommend insulin pens and support patient education.

While this insight speaks to the needs of healthcare professionals, it reflects a deeper issue for patients: trust in the provider's knowledge and the personalization of care. When HCPs lack access to training or up-to-date tools, patients may sense uncertainty, leading to doubts about whether the treatment recommendation truly fits their condition, lifestyle, or preferences. The emotional result is discomfort, hesitation, and a feeling of being given generic advice rather than individualized support.

Customer Profile

Job to be done:

- To receive treatment advice and support from healthcare professionals as part of diabetes care. This includes:
  - Asking questions or receiving guidance about devices or treatment options.
  - Listening to provider recommendations during appointments.
  - Deciding whether to follow the advice given or seek second opinions.

Pains:

- Sensing that recommendations are generic or rushed.
- Feeling unsure whether the provider fully understands the device or treatment.
- Lack of trust in whether the treatment fits their personal situation.

Gains:

- Trust that the provider understands the patient's individual needs.
- A sense of personalized care, not one-size-fits-all solutions.
- A strong, respectful, and informed relationship with the healthcare team.

Value Map

Pain Reliever:

- Reduces doubt and hesitation by ensuring patients feel seen, understood, and supported with relevant, up-to-date knowledge.

Gain Creator:

- Builds a sense of trust and security in the care relationship.
- Helps patients feel their needs are recognized and their treatment is tailored.

Products or Services:

- May include better HCP training materials, tools that encourage shared decision making, or systems that allow professionals to explain treatments clearly and confidently, reinforcing trust from the patient's perspective.

Resulting Value Proposition

To trust that my healthcare provider understands my individual needs.

Insight 23

Pen injectors are perceived as more convenient and less painful than alternatives.

Customer Profile

Job to be done:

- To administer diabetes treatment. This includes:
    - Using pen injectors or other delivery methods.
    - Managing physical discomfort from needles or repeated injections.
    - Making treatment decisions based in part on how painful or uncomfortable it feels.

Pains:

- Physical pain or discomfort from injections.
- Anxiety or dread associated with painful delivery methods.
- Avoiding treatment or delaying it due to fear of pain.

Gains:

- A more comfortable, less stressful treatment experience.
- Relief from the physical and emotional toll of daily injections.
- Improved consistency in treatment due to reduced discomfort.

Value Map

Pain Reliever:

- Minimizes the physical discomfort of treatment.
- Reduces fear, hesitation, or emotional resistance linked to pain.

Gain Creator:

- Promotes comfort and ease, making it more likely that patients stick to their treatment plan.
- Helps integrate care into life with less stress.

Products or Services:

- May include user-friendly pen injectors, finer needles, alternative delivery methods.

Resulting Value Proposition

To manage my diabetes with as little pain as possible.

Insight 24

Fear of incorrect dosing and unknowingly using an empty cartridge creates anxiety. HCPs also express concerns about proper insulin delivery and dosage accuracy.
This insight highlights the emotional and physical risk patients associate with uncertainty in insulin delivery. Whether caused by device limitations or personal doubts, the lack of clarity around whether the correct dose has been administered can lead to anxiety, hesitation, or even unsafe behaviors. It also undermines trust in both the tools and one's own ability to use them confidently.

Customer Profile

Job to be done:

- To prepare and take insulin. This includes:
    - Loading and using insulin pens or devices.
    - Checking that cartridges are full and functioning.
    - Administering the amount of insulin for each situation.
    - Monitoring outcomes to verify whether the dose was effective.

Pains:

- Anxiety about underdosing or overdosing.
- Worry that a dose was missed due to an empty or malfunctioning pen.
- Constant need to double-check or seek reassurance.

Gains:

- Confidence in every dose.
- Peace of mind that the right amount of medicine was delivered.
- A sense of safety and self-trust in managing insulin use.

Value Map

Pain Reliever:

- Addresses fear of dosage errors and reduces second-guessing.
- Builds trust in the treatment process.

Gain Creator:

- Supports emotional calm, physical safety, and confident self-management.
- Helps turn insulin delivery into a routine, not a source of stress.

Products or Services:

- May include devices with dose confirmation, empty cartridge alerts, clear visibility features, or training/support that reinforces correct usage and reduces anxiety.

Resulting Value Proposition

To be sure I'm getting the right amount of medicine.

Insight 25

HCPs worry about misadministration among those with low literacy.

This insight can be included in the value proposition **To manage my treatment easily**, as it highlights the importance of simplicity and intuitive use in treatment tools. When instructions are difficult to understand or devices require complex steps, patients with low literacy may be at greater risk of errors. A simpler, more accessible treatment experience benefits everyone, but is especially important for vulnerable users.

Insight 26

DuraTouch is considered easy to use, with a smooth dose adjustment mechanism.

This insight can be included in the value proposition **To manage my treatment easily**, as it reflects a key aspect of what makes a treatment tool usable in everyday life. When dose adjustments are smooth and intuitive, it reduces stress, speeds up the routine, and lowers the risk of error, all of which contribute to a more manageable and less burdensome experience. Positive experiences with specific tools like DuraTouch reinforce the broader need for devices that support ease and confidence in treatment.

Insight 27

Patients often feel emotionally isolated; family and friends may not fully understand their challenges, and online communities provide limited emotional support.

This insight reflects the emotional strain that comes not just from managing diabetes, but from doing so without feeling understood. Many people feel they must constantly explain, defend, or downplay their experience, even to those closest to them. While online communities can help, they often lack the intimacy or emotional safety that people seek. The result is isolation, emotional fatigue, and a longing to feel seen, heard, and supported without judgment or pity.

Customer Profile

Job to be done:

- To manage the emotional side of living with diabetes in a social world that often doesn't fully understand it. This includes:
    - Talking to family, friends, or peers about the condition.
    - Trying to express how challenging diabetes can be.
    - Carrying emotional weight when support is superficial or misaligned.

Pains:

- Feeling emotionally alone, even in company.
- A lack of safe, validating spaces to talk openly.
- Frustration when others respond with pity, minimization, or advice instead of support.

Gains:

- Feeling emotionally supported and understood.
- A stronger sense of belonging and emotional resilience.
- Comfort and connection with people who listen and empathize.

Value Map

Pain Reliever:

- Reduces emotional isolation by encouraging deeper, more understanding relationships.

Gain Creator:

- Fosters emotional strength, comfort, and connection through authentic support.
- Builds trust and belonging in personal and peer relationships.

Products or Services:

- Could include guided peer support programs, conversation tools for family members, or emotional health resources designed specifically for people with diabetes and their close ones.

Resulting Value Proposition

To feel emotionally supported and understood by the people around me.

Insight 28

Strong social support improves treatment adherence and emotional well-being.

This insight can be included in the value proposition **To feel emotionally supported and understood by the people around me**, as it highlights the powerful role emotional connection plays in both mental health and practical diabetes management. When people feel truly supported, they are more likely to stay engaged in treatment.

Insight 29

Women manage diabetes care for others but receive less support themselves, thus self-care is de-prioritized due to household responsibilities.

This insight can be included in the value proposition **To feel emotionally supported and understood by the people around me**, as it highlights the emotional and relational imbalance that many caregivers face. When they carry the weight of caring for others, often without receiving the same support in return, their own needs are pushed aside. This lack of reciprocity creates emotional isolation and reinforces the need for understanding, recognition, and meaningful support from those around them.

Insight 30

Stigma leads to hiding one's condition, avoiding insulin injections in public, and delaying treatment due to fear of social judgment.

This insight can be included in the value proposition **To feel that diabetes is understood and taken seriously by others**, as it reveals how lack of awareness and social sensitivity can drive people to hide their condition or avoid essential care. Fear of being judged, stared at, or misunderstood contributes to emotional strain and risky behavior. When diabetes is better understood by the public, it becomes safer to manage the condition openly and without shame.

Insight 31

Patients struggle to integrate structured diabetes routines into everyday life, especially when support during the transition is lacking.

Customer Profile

Job to be done:

- To adjust to new diabetes routines and expectations during times of change. This includes:
  - Implementing treatment plans into existing daily schedules.
  - Managing meals, medication, and tracking without disrupting work, family, or personal life.
  - Solving day-to-day challenges after diagnosis.

Pains:

- Struggling to apply medical advice in real-life contexts.
- Slower or more stressful transitions due to lack of follow-up.
- Feeling abandoned or unsupported after diagnosis.

Gains:

- Feeling supported and guided through key transitions.
- Confidence in applying diabetes care to daily life.

- A smoother, healthier adjustment process.

Value Map

Pain Reliever:

- Reduces feelings of isolation and overwhelm during major care transitions.
- Offers practical, timely support tailored to the person's real-life routines.

Gain Creator:

- Improves treatment success and emotional well-being by making transitions feel manageable and supported.
- Encourages stronger engagement and self-trust.

Products or Services:

- Could include coaching, support programs, onboarding tools, or platforms for practical guidance.

Resulting Value Proposition

To get support when adapting to life with diabetes.

Insight 32

Motivational support from trusted healthcare professionals or family members helps patients feel less burdened and more engaged.

This insight shows that people with diabetes benefit not only from advice or technical help but from acknowledgment of their ongoing effort. When a healthcare provider, partner, or friend shows appreciation for the work involved in self-management, it helps reduce emotional fatigue and reinforces a sense of purpose. Recognition makes the invisible labor of diabetes care feel meaningful.

Customer Profile

Job to be done:

- To carry out the ongoing work of managing diabetes. This includes:
  - Monitoring blood glucose, food, exercise, and medication daily.
  - Planning meals, adjusting routines, and preparing supplies.
  - Following through on treatment even when motivation is low.

Pains:

- Feeling that no one notices how hard diabetes management is.
- Emotional fatigue from following a rough treatment without encouragement.
- Loss of motivation due to lack of recognition or appreciation.

Gains:

- Feeling seen and acknowledged for ongoing effort.
- Renewed emotional energy from being valued.
- A sense that one's work matters.

Value Map

Pain Reliever:

- Addresses emotional fatigue by providing encouragement and appreciation.

Gain Creator:

- Fuels motivation by making self-care feel meaningful and acknowledged.
- Encourages sustained engagement with diabetes routines.

Products or Services:

- Could include HCP feedback tools, encouragement features in digital platforms, or simple mechanisms that allow family and care teams to recognize effort.

Resulting Value Proposition

To feel that the effort I put into managing my diabetes is valued.

Insight 33

Self-reflection, personal goal-setting, and gradual lifestyle planning enhance confidence and treatment adherence.

Customer Profile

Job to be done:

- To manage diabetes through routines that reflect personal goals and lifestyle changes. This includes:
    - Reflecting on daily habits and how they affect the condition.
    - Setting realistic goals for nutrition, activity, or medication adherence.
    - Adjusting routines gradually over time.
    - Finding motivation to keep moving forward without feeling overwhelmed.

Pains:

- Feeling stuck or unmotivated by rigid treatment plans.
- Difficulty seeing long-term progress or future possibilities.
- Burnout from trying to change too much at once.

Gains:

- A renewed sense of hope and direction.
- Confidence in small wins and gradual progress.
- A belief that life with diabetes can still be positive and fulfilling.

Value Map

Pain Reliever:

- Eases emotional fatigue by focusing on personal meaning and gradual improvement.

Gain Creator:

- Builds long-term optimism and resilience.
- Supports people in seeing a meaningful, empowered future, not just a condition to be managed.

Products or Services:

- Could include goal-setting tools and progress-tracking features.

Resulting Value Proposition

To feel optimistic about my future with diabetes.

Insight 34

The mental and emotional toll of managing diabetes alone often leads to fatigue, overwhelm, and treatment neglect.

This insight highlights the invisible emotional burden many people carry when managing diabetes day after day. Beyond feeling supported by others, people need inner resilience to stay engaged, hopeful, and steady, even when care feels hard.

Customer Profile

Job to be done:

- To manage the emotional weight of ongoing self-care. This includes:
    - Staying engaged with treatment routines despite stress or exhaustion.
    - Pushing through periods of low motivation, fear, or discouragement.
    - Managing emotions like guilt, shame, or loneliness around diabetes.

Pains:

- Emotional fatigue and burnout from long-term care.
- Feeling overwhelmed or defeated by the constancy of diabetes.
- Struggling with motivation during tough periods.
- Neglecting care due to emotional exhaustion.

Gains:

- Feeling resilient and emotionally grounded.
- A stronger emotional foundation for long-term health.

Value Map

Pain Reliever:

- Acknowledges the emotional toll of self-care and provides tools or support to reduce that burden.

Gain Creator:

- Strengthens internal motivation and emotional resilience.
- Reinforces the belief that even when things are hard, the person is capable.

Products or Services:

- May include emotional support tools, mental health resources, check-ins or reframing strategies to sustain emotional engagement in self-care.

Resulting Value Proposition

To feel emotionally strong while living with diabetes.

XIV   Appendix XIV

- Requirements

PAIRWISE COMPARISON MODULE – 15 ROUNDS PER PARTICIPANT

QX. Which of the following two statements do you value most?

Note: You may see some statements more than once. This is intentional, as it helps us understand how they are valued in different contexts.

Each participant will complete 15 comparisons. These are drawn from a total of 45 possible pairs across 10 statements.

Pairs are randomly selected, and presentation order is balanced to avoid bias (e.g., to avoid one statement always appearing on top).

The system records:

- The full pair of statements shown
- The statement selected by the participant
- The order in which each was presented

This data supports a preference modelling method (e.g., Bradley-Terry model) and requires the comparison-level data to be saved with pair context intact (not just which one was chosen).

Statements:

1. I feel sure I am getting the right amount of medicine.
2. I trust that my diabetes treatment is safe and reliable.
3. I feel free to live my life alongside my diabetes.
4. I feel confident making decisions about my diabetes.
5. I have a simple treatment routine.
6. I can communicate easily with my healthcare provider.
7. I feel in control of my diabetes.
8. I experience as little pain as possible when taking my diabetes treatment.
9. I feel emotionally strong while living with diabetes.
10. I get support when I'm adapting to life with diabetes.