AI Chatbots in Design Thinking

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Motivation

Traditional Design Thinking (DT) consulting faces several challenges, such as balancing structure with creativity and managing high personnel costs due to intensive client interactions [1; 2; 3].

This research investigates the potential of using AI-driven chatbots, specifically GPT-4 by OpenAI, to automate aspects of the DT process in business and IT consulting. By focusing on the early DT phases where personas and user needs are identified.

The main objective: Develop a chatbot to facilitate the creation of actionable personas and user stories, enabling consulting firms to scale client interactions without additional human consultants or training requirements.

System Architecture

The chatbot was developed on the SAP Business Technology Platform (BTP) and integrates OpenAI's GPT-4 API to automate parts of the DT process. Key components include (see also Fig. 1):

1. **Approuter:** Manages routing and security, directing user requests securely to backend services.
2. **Backend (CAP Node.js):** Executes business logic, interfaces with the SAP HANA Cloud Database for data storage, and connects to the OpenAI API for content generation.
3. **Frontend (SAP UI5):** Provides a user-friendly interface, following SAP Fiori principles for consistency.
4. **Design Thinking App:** Core interaction module that processes user input, communicates with the OpenAI API, and stores data.
5. **SAP HANA Cloud Database:** Ensures fast, real-time data storage and retrieval with its in-memory architecture.

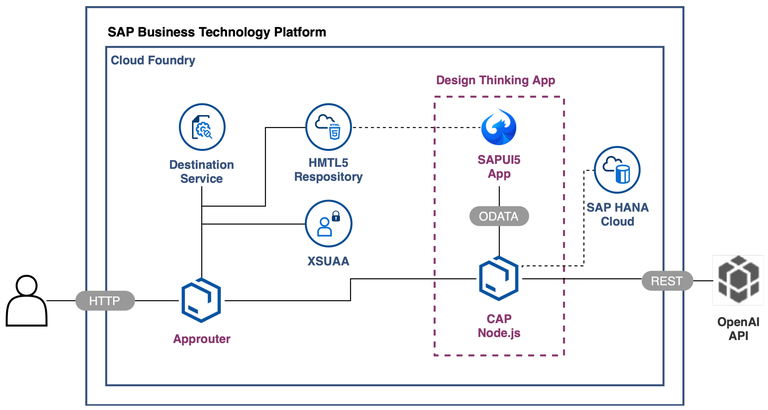

Figure 1. Architecture showing main components and services on SAP BTP Cloud Foundry

Prompt Engineering for Design Thinking Chatbot

Effective prompt engineering is essential to guide the LLM in generating accurate personas and user stories within the DT process.

1 Clear Instructions
- Define DT context explicitly to limit responses
- Avoid off-topic answers by focusing on DT
- Ensure relevance with precise, goal-oriented prompts

2 Reference Texts
- Provide sample personas and user stories
- Align model outputs with DT needs
- Improve accuracy by setting clear format expectations

3 Breaking Down Tasks
- Step-by-step sequence: context → problem → stakeholders → personas → user stories
- Use 5-Why method for in-depth problem analysis
- Maintain coherence and relevance at each stage

Figure 2. Key Principles in Prompt Engineering for this scenario

Personas and User Stories

Table 1 illustrates examples of human-created and AI-generated personas and user stories during the case study.

Table 1. Personas and User Stories created during the case study

Personas	
Human-created	**AI-generated**
Name: Rita Rührig **Personality:** Standard user **Age:** 45 **Role:** Administration **Needs:** Security, trust, communication, openness **Interests:** Cooking, traveling, focus on core business, little involvement in others' tasks **Skills:** - Sending payments/receipts to DATEV - Uploading receipts to DATEV (incl. categorizing as supplier invoice, outgoing invoice, cash receipt, credit card statement) - Assigning receipts to incoming/outgoing payments - Tracking individual invoices to a payment item **Barriers:** - Fear of colleagues accepting new workflows **Resources:** - Training/introductions - Colleagues - Tax advisor	**Name:** Uwe Umtriebig **Personality:** Extreme user **Age:** 35 **Role:** Administrative employee **Needs:** Recognition, autonomy, self-fulfillment **Interests:** Digital transformation, automation of processes **Skills:** - Very fast in manual data entry - Always efficiency-minded - Good knowledge of tax software **Barriers:** - Frustrated by repetitive tasks - Feels underutilized **Resources:** - Fast keyboard - Two monitors - Personal scripts for work facilitation.
User Stories	
As *an administrative employee*, I want to *send all collected payments and receipts of all colleagues to DATEV at once*, in order to *save effort*.	As *an administrative employee*, I want to *have an interface between the credit card system and the tax software*, in order to *avoid manual entries and reduce errors*.

Challenges in Implementation and Integration

Implementing the LLM-based chatbot in a DT context presented several key challenges:

- **Automation Consistency:** Ensuring the DT sessions run fully automated without user interruptions was challenging, requiring careful prompt design and robust error handling.
- **Deployment on SAP BTP:** Integrating with SAP's BTP involved complex configuration, with initial deployment taking over 40 hours due to unfamiliarity with the environment and configuration specifics.
- **Prompt Tuning:** Fine-tuning OpenAI's GPT-4 API parameters (e.g., temperature, frequency penalty) was essential to balance creativity and relevance in responses, especially when generating personas and user stories.
- **Data Privacy and Security:** Managing sensitive client information required strict adherence to GDPR standards. OpenAI's compliance with SOC 2 and data encryption was leveraged to address security concerns.
- **Quality Control and Diversity in AI Outputs:** Ensuring the generated personas and user stories were high-quality and contextually relevant necessitated regular human review. Additionally, promoting diversity in AI-generated outputs remains a challenge, underscoring the need for refined strategies to achieve inclusivity.

These challenges highlight the complexities of integrating AI into structured, user-centric processes like DT, especially in consulting environments. Overall, our findings indicate that LLM-based chatbots offer notable advantages over traditional human-led DT consulting, particularly to generate personas and user stories, leading to considerable time savings.

References

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