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Enhancing Service Design: The Potential of Large Language Models for Innovation

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ABSTRACT

Service design is a well-established discipline across many industries, valued for its capacity to improve user experience by employing a methodology and mindset that embrace a wide range of interpretations, making it applicable to any human activity. This thesis examines service design from a practical perspective, focusing on its most widely used tools, which will be experimented in the second core topic of this thesis: Large Language Models.

Specifically, there is an attempt of explaining Large Language Models by simplifying the architecture of a Generative Pre-trained Transformer (GPT). This explanation serves as the groundwork for the final section, where customizable GPTs are used to enhance traditional service design tools.

The objective of this study is to discover new approaches to leverage this emerging technology within the field of service design, providing tangible solutions for industrial applications in order to save time, produce better results, coordinate the team and provide several insights.

INTRODUCTION

This thesis addresses and combines two major disciplines with the aim of enhancing one of them to improve a company's ability to satisfy customers through a smooth customer experience during the service delivery process. These two disciplines are explained in the first two chapters to build the foundation for the final experimentation process, which is the main scope of this work.

The first chapter discusses the service design methodology in general terms, introducing the double diamond, a theory that outlines a possible approach for any creative activity, and provides a deeper insight into its practical application. The concepts behind service design application are explained following a major guide, the book "This Is Service Design Doing" written by Stickdorn, et. al. (2018). The focal point of the first chapter is the explanation of three important tools: personas, service blueprint and customer journey maps.

The second chapter is distinct from the first, as it aims to explain the emergent technology of Large Language Models (LLMs). Since the literature lacks accessible explanations on this topic, the theory is simplified through a structured and straightforward narration. A significant contribution to this work is derived from the paper "A mathematical framework for transformer circuits" realised by Elhage, N., et. al. (2021).

The first two chapters are essential for the final objective, which is to explore the use of LLMs in service design, particularly to solve creative problems that consume company's time and resources during the practical application of this methodology. The attempt involves using a technology called GPT-4, developed by OpenAI, to create a virtual assistant that supports the creation of the previously mentioned service design tools. During this attempt, a step-by-step approach is

used to help the reader understand the process and replicate it in other specific contexts.

CHAPTER 1 – Service Design: meaning and its tools

The goal of this chapter is to understand the essence of service design and its practical application. To achieve this, a concise introduction to the theoretical aspects is provided, facilitating a more pragmatic exploration of this methodology. A special attention is given to its notorious and fundamental tools, which are at the base of a service design process, exploring their structure, construction process, and their potential benefits.

1.1 A service design definition

For a good understanding of service design a definition is reported and explained below:

“It is a human-centered, collaborative, interdisciplinary, iterative approach which uses research, prototyping, and a set of easily understood activities and visualization tools to create and orchestrate experiences that meet the needs of the business, the user and other stakeholders” (Stickdorn, M. et. al. 2018).

This is one of several definitions proposed for service design that encompasses all the concepts, crucial to consider when we are dealing with service design. Indeed, this definition undercovers many aspects of it: firstly, it constitutes an organizational approach aimed at enhancing and/or generating one or many value proposition/s. Embedded within this approach there are key features such

as the human-centricity because it engages not only the customers but all the stakeholders that are affected by a service (e.g. employees, customers, managers, etc.). Moreover, the engagement is real and practical because it brings people involved to collaborate one to each other so that a better outcome can be achieved, ensuring to consider all service-related perspectives. It is evident that this kind of cooperation among different stakeholders means engaging people with different backgrounds and interests, thus underscoring another hallmark of service design: its cross-organizational and multi-disciplinary nature. As explained in the next paragraphs, the service design is a sort of a common language that connects people from the different “silos”¹ of a company by using simple and meaningful tools (Stickdorn, M. *et. al.*, 2018).

The last key element of service design lies in its iterative process. This implies a methodological approach characterized by continuous refinement through recurring stages: beginning with broad research, followed by ideation, prototyping and concluding with implementation. Initially, these phases may appear nebulous and generalized. However, as the iterative cycle progresses, knowledge improves through the insights gained from both failures and successes along the journey.

In the final segment of the definition, we grasp the true value of service design. Beyond building a smooth experience, its purpose is to meet the needs of customers, which are the individuals that pay for such service. Consequently, the company benefits as well, with its revenues that are more likely to grow.

From this analysis, we can determine the principles of service design which are accurately described by Stickdorn, M. *et. al.* (2018). They affirm what has been said before and fortify certain aspects that will be elaborated upon in subsequent paragraphs. These principles, totalling six, are outlined below:

1. Human-centered design
2. Collaborative design

¹ “silos” refers to the organizational units of a company, so they correspond to the work functions. They usually operate as single entities without an efficient communication among them.

3. Iterative design
4. Sequential design
5. Real design
6. Holistic design

1.2 Service design doing

Now that the more theoretical concepts regarding service design have been introduced, it becomes possible to understand what it means doing service design. Because this approach is more practical and based on facts and data rather than subjective opinions and frivolous notions.

1.2.1 The double diamond

To introduce the way of working that characterize any service design project, a model called double diamond, created by the Design Council (2005), is presented below. This mindset should keep in mind of people along the iterations because it allows a better execution of the activities, avoiding problems that may arise along the project.

The *double diamond* represented by the figure 1.1 explains the concept of convergent and divergent thinking. Within this framework, we can identify two diamonds representing respectively the problem (the diamond on the left) and solution (the diamond on the right) space. Where inside of the problem space lies the initial phase of the design activity, characterized by the identification of the right problem. Indeed, as suggested by Stickdorn, M. *et. al.* (2018) in their analysis, when a service design process kicks off, it is essential to first understand the right problem to solve, so that useless investments for solving the wrong problem are reduced. This phase called *discover* stage entails a divergent

approach, where stakeholders try to brainstorm and discover all potential problems or tasks to solve, paving the way to the convergent phase: the *define* stage. This closing stage is focused more on making decisions about what has been found before. It is a “pivoting point where a project either receives approval or is killed” (Gustafsson D., 2019).

It is clear that the two phases necessity different skill sets: creativity and open-mindedness are valued in the initial stages, while rationality is prized for analysing implications, risks, costs and benefits to discard or accept an emerged issue. Hence, the necessity to involve multi-disciplinary people.

The second diamond, known as the solution space, begins with the output of the problem space, which is the right problem to solve. From there, a divergent approach is again employed to find all possible solutions of such problem. So, there is the space for testing, experimenting, brainstorming, prototyping, etc. At this stage called *develop* stage, visualization tools (like the ones presented in the paragraph 1.3) become essential to communicate and organize the team (Gustafsson D., 2019). Obviously also here the creativity is prized over the rationality which instead is more useful to conduct the second half of the diamond: the *deliver* stage. This part aims to find the solution or a set of solutions which can be utilized for subsequent steps or for implementation.

Clearly, this method doesn't follow a linear process, even if the model in the figure 1.1 suggests it. This is because, as it has said before, a service design project involves numerous iterations and refinement processes which produce feedback for improving people knowledge. This allows to re-start the approach with additional insights that were previously not available.

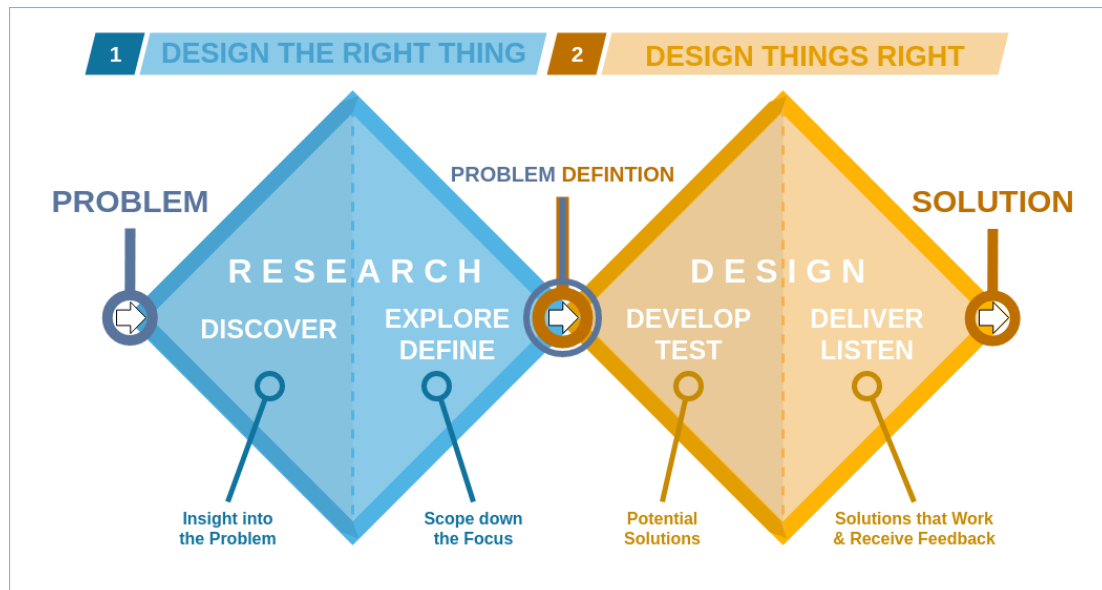


Figure nr. 1.1: The *double diamond*, source: Digi-ark, Wikipedia (2024)

1.2.2 The core activities

Service design is not only a mindset; it is a methodology, an approach supported by its core activities: *research*, *ideation*, *prototyping* and *implementation*. All of them cover the stages of the *double diamond* model described before; indeed, the *discovery* and the *exploration* stages are represented by the *research* activity, while *ideation* and *prototyping* represent the *development* stage. *Implementation* completes the last half of the diamond, corresponding to the *delivery* stage. The core activities explained below are a synthesis of what Stickdorn, M. *et. al.* (2018) said in their book.

- **Research:** It is the fundamental step of any service design project because it incorporates the foundations of a rational design activity. Its primary objective is to reach a profound understanding of stakeholders' needs, motivations, behaviours, and more, along the user experience of a service or product, achieved through the collection and analysis of qualitative and quantitative data. By doing so, it represents with facts the definition of service design and the six principles presented in the paragraph 1,

because its purpose is to overcome opinions and assumptions by increasing and developing the knowledge. This can be seen whenever there is a new question or problem along the project, because it foresees to open a new research activity whose outcome is to give feedback necessary to proceed in the right direction: therefore, an iterative and sequential nature behind the research can be recognized. Moreover, about this activity it is important to underline that behind its practices there is a divergent phase to initially collect more information and data as possible and then a convergent phase to filter them out, allowing to present efficiently the correct results to the stakeholders.

- *Ideation*: When a solid base has been generated, the process of ideation starts. Like other activities in service design, it reflects the typical features of the discipline. It begins with a divergent phase, where many ideas are generated by the team, including potentially bad ideas. However, idea generation is not limited to this phase, but like the service design principles declare, there is an iterative process of working that call in action the ideas generation and selection at different step. Indeed, many ideas may arise unexpectedly in different moments of the project caused by doubts, experiments, etc. So, it is important to allow flexibility, even for ideas that have been accepted before, because they can be modified or even discarded.

Following the brainstorming of ideas, the most challenging part starts, because there is the selection of the ideas that require an objective point of view. This does not mean that only one best idea is chosen but a pool of few ideas, which are the most promising ones, are selected. This selection is not the final result but are the starting point of subsequent refinement processes through prototyping, experiments and research.

- *Prototyping*: It involves creating a prototype primarily for three main purposes: to explore, to evaluate and to communicate the user experience of a service or product. While these purposes may overlap in a prototyping session, it is beneficial to treat them as distinct entities.

Explorative prototyping entails the creation of a prototype using several methods such as quick-and-dirty² or close-to-reality³ prototyping, exploring at the same time the solution space through divergent thinking. This practice should open to new questions, opportunities and challenges, leading to subsequent phases of research and ideation.

Evaluation prototyping focuses on assessing how users will experience the prototype, utilizing qualitative methods such as interviews, surveys, and observations. This phase represents a convergent moment where the team seeks to reduce the solution space explored in the first explorative stage.

The final stage, *communicative prototyping*, serves as a test for the prototype by interfacing with end-users or a selected audience to discover new questions and to communicate the prototype's value.

Throughout all prototyping activities, it is crucial to maintain the focus on three key aspects which should converge into a fourth one. These aspects generate questions to guide the project. The three perspectives are: creating value for the customer (how can it be achieved?), the feasibility of the idea (How can it work?), and the look and feel of the experience (how can it be perceived?). As stated before, these three concepts should be unified into the fourth and final aspect: integration (how can they be harmoniously integrated in the prototype?).

To conclude, it is important to emphasize that this practice aims to reduce the risk of failure and to enhance the quality of the user experience through experimentation, testing and evaluating deliverables.

- *Implementation*: It is the last stage of service design, demanding a range of skills to manage its complexity as it interfaces with numerous stakeholders. Foremost among these, are employees not directly involved

² Quick-and-dirty prototyping is a rapid process of prototype creation to achieve as soon as possible the result which may not be the final form, but it is a good attempt to stimulate reflections. It is a practical starting point, rather than getting lost in a sea of attempts that aim to find the best solution.

³ Close-to-reality prototyping is a method used to obtain a prototype as similar as possible to the final product or service in terms of functionalities, behaviour and look. It is useful in the last stages of the project to confirm or reject the earlier assumptions.

in the design process, who may not trust the change. However, the implications regard not only the staff but are extended to the market with the introduction of new service or product, and so necessitating adjustments within the management framework to support and monitor with new KPIs the processes. Moreover, the broader ecosystem is affected by new environments, IT systems, suppliers, etc. which may be potentially involved. Once implementation begins, testing or simulations end, making any change almost permanent. This permanence is driven by financial implications of process adjustments, which compound complexity over time. Consequently, any post-implementation modifications, whether errors or improvements, carry substantial impact. Therefore, it is crucial to conduct the best possible preliminary phase.

1.3 Service design tools

To facilitate designers' progress through design activities several tools are available, where most of them are visualization tools that increase the communication and organization of the design team. Indeed, as mentioned in paragraph 1.1, service design activities involve an array of individuals with different backgrounds that generate a multi-disciplinary and cross-functional group. While this diversity is an advantage for catching different service perspectives, it can also create communication challenges (Stickdorn, M. *et. al.*, 2018). In such scenarios, a pragmatic approach involves leveraging common and shared tools that are easily comprehensible irrespective of one's expertise. These tools are designed to guide project participants effectively: exploiting their competences and achieving a satisfying result. To enhance understanding of the value of these tools, below are three of the most important and commonly used tools in service design. They are presented with the aim of capturing their essence through analysis of their structure, construction process and benefits.

1.3.1 Personas

The concept of personas, as introduced by Cooper, A. (1999), is a widely recognized tool for enhancing communication and organization by aligning the interdisciplinary team to the same page. To grasp what a user-personas entails, it is useful to refer to Cooper's definition:

“User models, or personas, are fictional, detailed archetypical characters that represent distinct grouping of behaviours, goals and motivations observed and identified during the research phase” Cooper, A. (1999)

As elucidated by Blomkvist, S. (2002) in his analysis of this tool, the definition encapsulates the essential understanding of personas. Firstly, personas are not actual individuals exactly described in a few rows of text; rather, they are fictional characters that represent a group of people with similar behaviours, goals and motivations with which design teams can involve. These attributes are identified during the research phase but are refined and shaped throughout the design process to make them more concrete and effective. Personas is a tool that can be used for any type of users, not only customers or potential customers but also employees, a particular market segment or any kind of stakeholder group.

1.3.1.1 Building a persona

To construct an effective and believable persona, Cooper *et al.* (2014) delineate a step-by-step process synthesized in this paragraph. The initial task involves conducting research to gather customers data using different methods like interviews, market segmentation analysis, surveys, etc., which influence the outcome of the persona creation process. From this dataset, the team must

discern significant patterns in behaviours, emotions, and goals, enabling them to group similar attitudes into archetypical users. This stage is critical to avoid the trap of stereotypes, which rely on assumptions rather than factual data, due to the team's cognitive biases⁴. Moreover, there is a risk to identify average users instead of singular users with distinct behavioural profiles among a range of possible ones. Anyway, these potential behaviours must be explained by motivations that determine why people act in a certain manner. Therefore, the team must understand and synthesize people's relevant goals to ensure that the design of the product or service is such that help such group of people to achieve their objectives. After all, people are not merely interested in purchasing a service or a product; they seek to fulfil their needs (Stickdorn, M. *et. al.* 2018). Once that the first part is done, the narrative of personas can be developed.

1.3.1.2 Persona structure

In the Figure 1.2, an example of persona is provided, illustrating all the necessary details that a team should define during the development of this tool. The initial focal point is the portrait image, which is a very sensitive decision to make, because it can inadvertently generate stereotypes, that must be avoided. About that, in line with Stickdorn, M. *et al.* (2018), It is preferable to opt for gender-, age- and ethnicity neutral sketches. After that, it is essential to provide a name and an age to the persona to personify the character, facilitating identification for designers (Hayes, B.). Following this, demographics and geographics information is included to provide context to the persona, thereby creating a specific representation of the target segment. In the end, to enhance the persona's description, additional details such as a brief description and its behavioural patterns and goals are incorporated into the tool.

⁴ Cognitive bias refers to a systematic error in how individuals process information, which is caused by automatic and distorted mental processes.

UX Research Tools: User Persona

Personal Details

Demographics: Family, language, HHI

Work Experience: Years, training, staff

Devices: Phone, browser, IoT

Tech Exposure

1 Low 2 Medium 3 High

About

Include a short description of your user persona. Summarize who they are and how they're connected to your experience. Treat it like an elevator pitch and avoid adding imaginary details you haven't observed first-hand.

Patterns & Behaviours

- Patterns are UX-relevant habits
- They can be physical or digital
- They are typified by "desire lines"
- Look for shortcuts, common phrases and other relevant reflexes

Goals & Motivations

- Goals are the most important aspect
- And should always be actionable
- Motivations are what drive personas
- Akin to personal KPIs
- Be careful to avoid assumptions

Persona Name

Age, Role / Title (if relevant)

City, State

QUOTE

"Quotes bring additional realism to your users. Include verbatims collected in UX research."

Konrad.com

Figure nr. 1.2: An example of *persona* provided, source: Konrad (2024)

1.3.1.3 Benefits of using persona

In the literature, personas are widely discussed for their numerous benefits, as they can be applied across various departments and fields within a company and among industries. A study by Salminen, J. (2022) suggests that personas are increasingly utilized not only in software development but also in addressing social issues. They have demonstrated flexibility, being applicable at any stage of the design process: from the conceptualization of an idea to final communication with stakeholders or in combination with other methods to strengthen the decision-making. A particularly insightful analysis conducted by Miaskiewicz, T., & Kozar, K. A. (2011), supported by qualitative and semi-

quantitative methodologies, tries to determine the effective advantages that this tool can bring to a company. The findings highlight the most significant role of such a tool, which lies in its ability to direct designers' focus on the actual needs of target customers, thereby avoiding generalizations and connecting the designers with the customer world. Another notable aspect of personas is their capacity to challenge organizational assumptions about users, promoting a strong and true consumer-centred design attitude. Furthermore, the utilization of personas in design activities aids in focusing more effectively on selected target customers segments.

1.3.2 Service blueprint

Service blueprint, introduced by Shostack, G. L. (1984), represents a pillar of the service design. This versatile tool offers flexibility and adaptability in illustrating interactions, actions, touchpoints and technologies in a service experience among stakeholders. It serves a broad range of purposes, from mapping current-state services exploring critical issues or areas for improvements, to mapping future-state services guiding the development of new experiences aimed at ensuring users satisfaction. Moreover, it allows for starting with a low level of process detail and in a second moment delving to explore specific activities, matching the level of individual's understanding (Remis, N., 2016).

Thanks to its intuitive nature, it facilitates coordination, communication and alignment among multi-disciplinary people, while maintaining the focus on the main actor of the experience.

1.3.2.1 Service blueprint structure

There are five elements shared by every service blueprint, namely:

- *Customer actions*
- *Frontstage actions*
- *Backstage actions*
- *Support processes*
- *Physical evidence*

These elements form the core of a service blueprint as they delineate five areas where actions happen. *Customer actions* represent the chronological actions (mental and physical) taken by a customer during the service experience. This region is positioned at the top of the service blueprint, highlighting the significance of the customer actions above the other activities which are perceived as supporting the service delivery process (Bitner, M. *et. al.*, 2008).

The second critical stage is *frontstage actions*, where are depicted all the actions carried out by the front office⁵ and relevant to service delivery. Directly below are *backstage actions*, representing the actions performed by the back office⁶. Subsequently, *support processes* encompass all the tools needed to enable a service delivery without directly involving the customer (e.g. software, internal processes, IT systems). The last element of a service blueprint is *physical evidence*, which is any tangible thing with which customers can interact, influencing their quality perceptions of the service.

To mark the passage between regions, three lines are present on the service blueprint:

- *Line of interaction*
- *Line of visibility*
- *Line of internal interaction*

The *line of interaction*, starting from the top, separates customer actions from *frontstage actions*. Here, every time this line is crossed by a link that connects

⁵ Front office refers to the segment of the office directly engaged in customer interactions.

⁶ Back office refers to the segment of the office indirectly engaged in customer interactions.

the customer with an employee, a moment of truth⁷ occurs, often accompanied by physical evidence. The *line of visibility* distinguishes what a customer can see with what they cannot in terms of actions, and it is inserted between *frontstage* and *backstage actions*. The last element is the *line of internal interaction* which marks the boundary between all actions and *support processes*.

All these elements are represented in the figure 1.3.

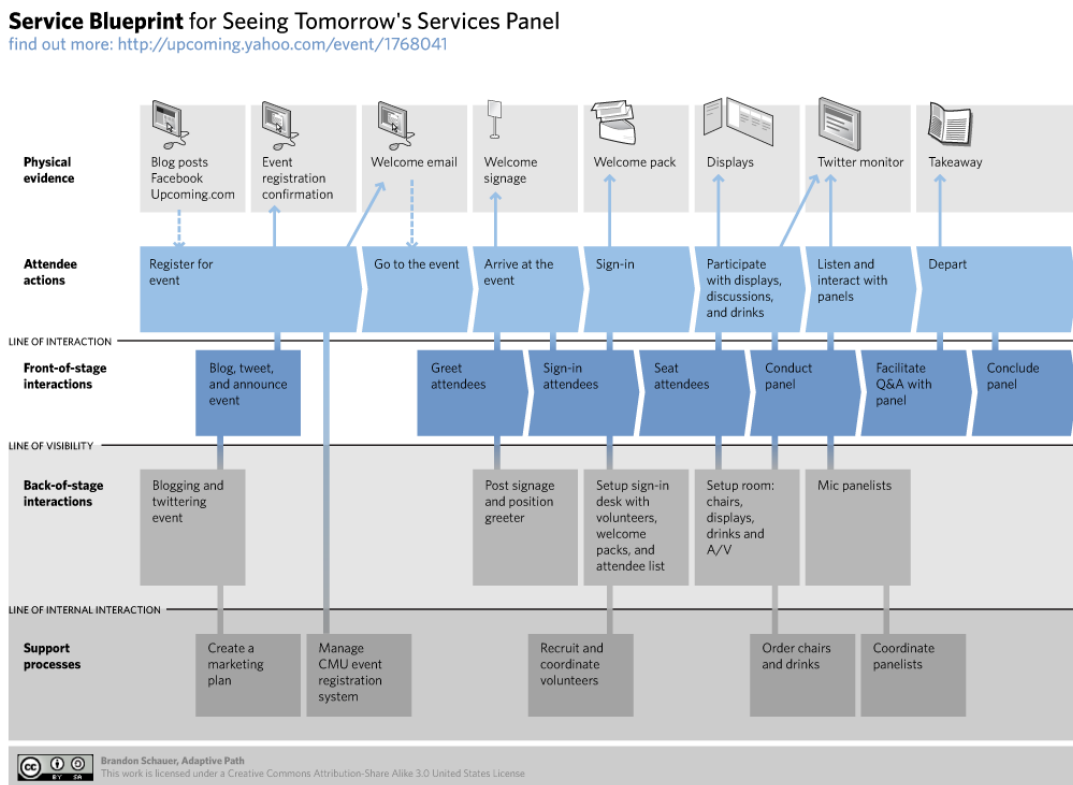


Figure nr. 1.3: An example of a *service blueprint*, source: Brandon Schauer, flickr (2024)

A service blueprint must be read from the left to the right because it follows the chronological order of events of the end-to-end customer experience⁸.

⁷ A moment of truth is a significant moment in the service delivery process because it marks a direct interaction between the company and the customer, thus generating an impression on the customer.

⁸ end-to-end customer experience is all the set of interactions between customers and an organization throughout the product or service delivery process.

For a greater comprehension of the customer experience is suggested to insert the moment of time of the different stages, so that the lose the sense of time is avoided, especially when tasks have different durations.

1.3.2.2 Building a service blueprint

According to Remis, N. (2016) the first step in creating a service blueprint involves building a team comprising stakeholders with different roles on the service or product delivery process. Thus, the multi-disciplinary composition of the team is crucial for obtaining most of the process information. Once, the collaborative environment is established, the next step entails identifying the target customers potentially affected by the service. Utilizing personas, as explained in the paragraph 1.3.1, proves beneficial in this regard. Therefore, for each group of customers, a service blueprint should be ideated (Bitner, M. *et. al.*, 2008), because the emotions and actions involved are different. After this initial phase of preparation, the team delineates the actions undertaken by customers along the service or product delivery process. Commencing with *customer actions* is considered a best practice as they serve as foundation for all other blueprint components (Bitner, M. *et. al.*, 2008). Indeed, the frontstage, backstage and support processes are inserted according to the actions performed by the customers to complete the end-to-end experience. At this point, almost all steps are delineated, and the team can establish the links between all the service blueprint elements. Arrows denoting these links illustrate how actions originate and their resulting consequences. This stage often reveals missing elements and information. The final insertion includes *physical evidence* that emerges from links between *customer actions* and *frontstage actions*.

Additionally, the team may incorporate other elements such as like temporal references, key moments and metrics to enhance the comprehension of the diagram.

Throughout service blueprint creation process, the team lives different moments, because the level of fidelity evolves through iterative processes (Remis, N., 2016). Initially, knowledge and cooperation levels may be low, but as the process develops, details arise, culminating in a polished model. Hence, it is crucial to follow a process of research when there are missing elements or low levels of comprehension, as well as a process of experimentation for prototyping ideas, as well as doing continuous assessment. Another crucial aspect to consider before and during blueprint production is the level of detail in the customer path. Indeed, several models can be created, with a zoomed-out approach recommended during the *research stage* to explore the service comprehensively. Conversely, a zoomed-in focus on critical steps is preferable when analysing specific aspects of the service before the *implementation stage* (Remis, N., 2016).

1.3.2.3 Benefits of a service blueprint

As highlighted by Remis, N. (2016) in his article, the reasons for utilizing a service blueprint in service design activities extend beyond merely enhancing communication and cooperation. This tool's rapid interpretability as a visualization tool serves as a foundation for three main benefits: visualization, alignment and prototyping. The primary advantage involves visualizing intangible customer experiences throughout the service or product delivery process, thereby making the implicit knowledge⁹ explicit. Activities are shared and visualized by all stakeholders, along with their connections and interdependencies, which reveal both problems and opportunities. Simultaneously, this shared knowledge enables staff to understand their contribution to the whole system. The creation process itself is a useful weapon to put in the same place individuals with different backgrounds, offering different perspectives on the service. This ultimately results in the second benefit of the

⁹ Implicit knowledge refers to competencies, information, and knowledge that individuals possess and utilize without being consciously aware of them or able to explain them.

service blueprint: stakeholder alignment. The final contribution regards the prototyping process. Indeed, a visualization tool like this one aids in understanding the impacts of decisions and changes on operational processes. Moreover, it enables the forecasting of potential outcomes of newly designed processes before investment.

1.3.3 Customer journey map

A customer journey map is a tool that “visualizes the experience of a person over time” (Stickdorn, M. *et. al.* 2018), observing his activities within an experience provided by an organisation. The design team analyzes this experience from various perspectives, including emotions, organizational interactions, and metrics, enabling them to visually identify pain points and opportunities for service improvement. Even though it might be similar to a service blueprint, it places greater emphasis on the customer’s viewpoint, leading to a deeper analysis of customer interactions. This tool is widely applicable in service design due to its high flexibility and adaptability to various situations, thanks to its modular nature.

1.3.4.1 Customer journey map structure

A customer journey map can take on various structures depending on its purpose, making it difficult to cover all possibilities. Nonetheless, despite their potential differences, they often share a common structure and elements, which are presented below. As affirmed by Stickdorn, M. *et. al.* (2018), each journey map revolves around the experience of a primary actor, typically represented by a persona. This experience is usually delineated through several stages that covers every step of the customer journey, which are defined by Webb, N. (2016) as five moments:

- Pre-touch moment: This involves a potential customer researching the organization's reputation and offer, forming initial impressions. The company should try to create a favourable impression at this stage through means such as advertisements, social media and website.
- First-touch moment: This marks the initial interaction between the customer and the organization, shaping the first impression based on the pre-touch perception. It is a critical moment as it influences the customer's future perception of the company.
- Core-touch moment: At this stage, the customer is acquired, but ongoing product or service innovation is necessary to retain him.
- Last-touch moment: This signifies the last interaction a customer has with a good or service. It is crucial for the company to ensure a positive goodbye to encourage the customer to return for future experiences.
- In-touch moment: Following the experience, this stage aims to maintain ongoing contact with the customer, not merely for selling other experiences, but to provide continuous value that encourages him return.

These main stages may vary, such as those suggested by Richardson, A. (2010), including "engage, buy, use, share and complete" or those proposed by Rosenbaum, M. S. *et. al.* (2017), comprising "pre-service, service, and post service". Regardless of their nomenclature, they all follow "a sequence of steps from the perspective of the main actor" (Stickdorn, M. *et. al.*, 2018), shaping the horizontal axis of a customer journey map.

The vertical axis significantly influences the effectiveness of a customer journey map, as it can be expanded into multiple lanes, making it more complex but more complete (Rosenbaum, M. S. *et. al.*, 2017). Within this axis, the customer journey map can transition into a service blueprint if the focus shifts towards the organizational structure and system aimed at delivering specific experiences to customers. Alternatively, it can evolve into an empathy map when emphasis is placed on the emotional journey of customers. Anyway, usually, this axis encompasses a mix of managerial insights, emotional journeys, and internal operations.

Among the various possibilities, fundamental lanes include the emotional journey of the customer representing their satisfaction level at each step visually highlighting issues associated with certain aspects of the experience (see figure 1.4). Another important element is the delineation of “channels” that refer to the communication channels utilized by customers to interact with the company at each step. Additionally, another lane could involve identifying stakeholders involved or responsible for specific activities (Stickdorn, M. *et. al.*, 2018). Numerous other lanes can be considered, such as KPIs, backstage processes, storyboards and more.

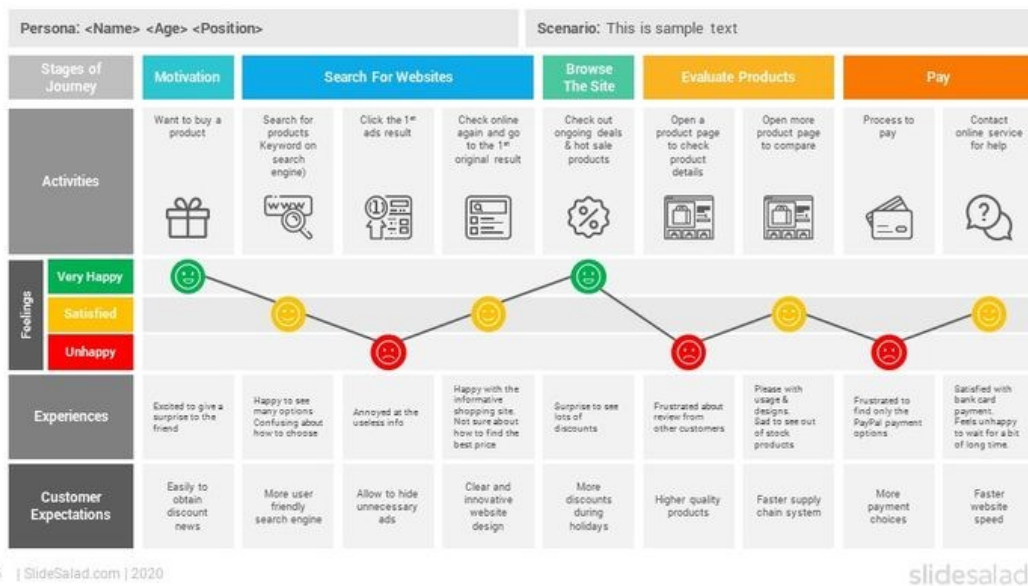


Figure nr. 1.4: An example of a *customer journey map*, source: Pinterest (2024)

1.3.4.2 Building a customer journey map

Building a customer journey map means begins with defining its scope, as outlined by Stickdorn, M. et al. (2018). Indeed, as previously mentioned, there are various types of customer journey maps, each one different on their scope

and structure. Several factors influence these major differences, which must be taken into account during this initial phase. They are exposed by Stickdorn, M. *et al.* (2018) and presented below.

Reliability is one of them and is determined by the utilization of data or assumptions that determine the quality of the analysis. Journey map based on assumptions can be deployed in the early stages, with the intention of refining them later with collected data, thereby obtaining a research-based map.

The second factor is the state of the map, which can detect the current state of an existing experience or the anticipated state of a future service to be implemented within organization's business. The third factor entails the perspective to be considered throughout the activities. This may encompass the customer's perspective as well as that of the employee, aiding in understand enhancements for a more favourable employee working experience.

Additionally, the scale of a journey map serves as a factor that affects the level of detail and temporal horizon of the analysed experience. A higher level of zoom entails analysing a short moment of the experience while increasing the level of details, whereas the opposite is true for a lower level of focus. Finally, the last significant factor to consider is the focus of the map, which distinguishes between a product-centred map and an experience-centred map. These differ in that a product-centred map solely considers touchpoints, whereas an experience-centred map encompasses the overall experience.

Once the scope has been defined, the main actor of the journey can be determined as well as the team members. Subsequently, the team starts to roughly delineate the activities of the customer journey by asking themselves what happens before and after each step, ensuring to cover the entire path. This process is time-consuming as it necessitates numerous iterations to refine and achieve the final version (Stickdorn, M. *et al.*, 2018). Here, a helpful activity is data collection through interviews or forms with stakeholders (Mucz, D., & Gareau-Brennan, C., 2019).

Upon establishing the horizontal axis, the vertical one can be developed through multiple lanes determined by the team based on the tool's scope. Cooperation and interaction are crucial to achieve a satisfying result, especially when attempting to empathise with the selected persona along the journey. Indeed, team discussions can reveal many similarities and differences, generating several beneficial perspectives.

Nevertheless, when building a customer journey map, it is necessary to have data that validates assumptions made, thereby enhancing the tool's reliability (Stickdorn, M. *et al.*, 2018).

1.3.4.3 Benefits of a customer journey map

The usage of customer journey maps in service design activities yields numerous benefits, as outlined in the literature. Indeed, several studies affirm that customer journey maps facilitate gaining crucial insights into customer engagement within an organization's offered experiences, thereby solving the complexity of services through visual representations (see, for instance, Mucz, D., & Gareau-Brennan, C., 2019; Rosenbaum, M. S. *et al.*, 2017; Shiratori, E. K. A., *et al.*, 2021). Simultaneously, it allows to understand where pain points occur (see, for instance, Mucz, D., & Gareau-Brennan, C., 2019; Shiratori, E. K. A., *et al.*, 2021), visually highlighting them and enabling teams to implement targeted solutions or improvements.

Mucz, D., & Gareau-Brennan, C., (2019) assert that these visual representations enhance meaningful conversations between staff and management regarding the customer experience, thereby avoiding wasting time on less significant touchpoints (Shiratori, E. K. A., *et al.*, 2021).

Furthermore, this tool helps in identifying touchpoints in the customer journey that may be skipped by the design team, ensuring a comprehensive understanding of the entire experience (Shiratori, E. K. A., *et al.*, 2021).

CHAPTER 2 – Large Language Model

In this chapter, the discussion revolves around generative artificial intelligence (generative-AI), particularly emphasized is the large language model (LLM), which promises to be the future of humanity. The objective is to gain an understanding of their operation to assess consciously both potential benefits and drawbacks. Therefore, the following paragraph outlines a simplified structure of a LLM, referred to as GPT, laying the groundwork for subsequent discussion that examines the benefits generated by LLMs through some use cases and the risks associated with LLMs use.

2.1 Large Language Model – an introduction

A large language model refers to a pre-trained language model (PLM) that has been up in terms of both model¹⁰ and data size (Zhao, W. X. *et. al.*, 2023). Essentially, a PLM is an algorithm able to solve various natural language processing (NLP)¹¹ tasks (for further details, see on <https://www.ibm.com/topics/natural-language-processing>). Enhancing the model and data size yields remarkable results, as it significantly enhances the model's ability to tackle tasks, thereby improving both its performance and its range of scope (Zhao, W. X. *et. al.*, 2023). According to Zhao, W. X. *et. al.* (2023) there are key distinctions between PLMs and LLMs. Firstly, LLMs exhibit unique emergent abilities that distinguish them by their capacity to solve highly complex

¹⁰ The term “model” refers to the machine learning algorithm used to fit data. In this context, it represents a sophisticated form of neural network.

¹¹ The natural language processing is a branch of artificial intelligence that aims giving computers the ability to recognize, understand and generate text and spoken words like human beings can (<https://www.ibm.com/topics/natural-language-processing>).

tasks. Secondly, LLMs revolutionize human-AI interaction through prompting interfaces, enabling users to assign tasks to LLMs, thus necessitating a deeper understanding of LLMs for effective prompt engineering. Lastly, there is a pressing need for refined research engineering to address the intricate challenges posed by LLMs.

Nowadays, there exists a variety of LLM models (as shown in figure 2.1) differing in architecture, training methodologies, and dimensions. However, among these, the most known for its powerful capabilities is the GPT series, which will be the focus of the subsequent paragraphs.

GPT is introduced as an artificial intelligence capable not only of generating textual content, which is the objective of a LLM, but also of producing images and sounds. This is because its architecture can be applied across multiple domains. Nevertheless, it is crucial to maintain focus of on LLMs within the context of this thesis.

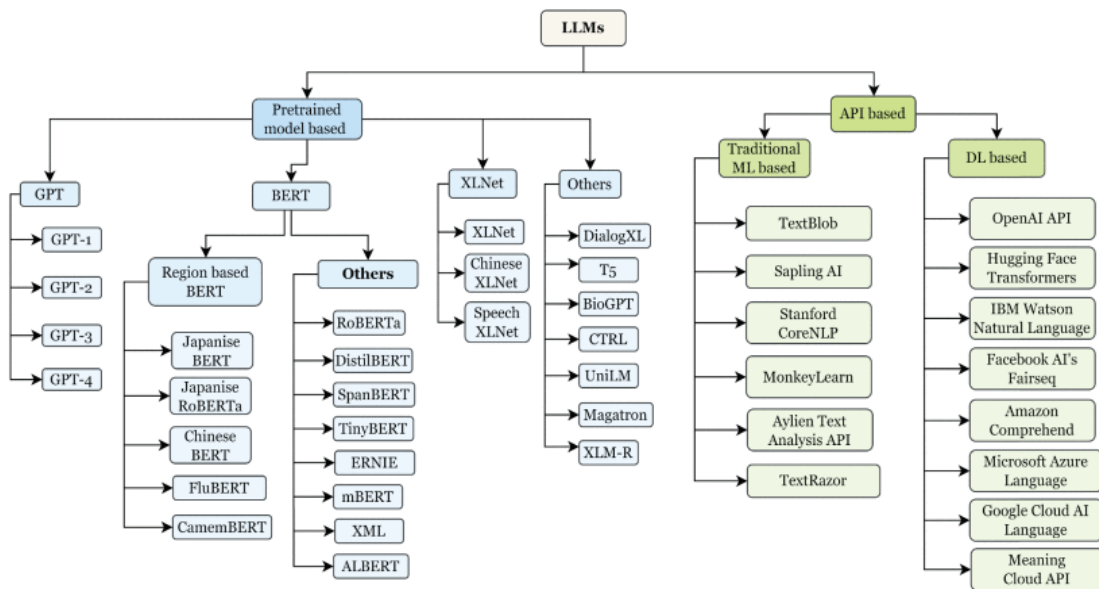


Figure 2.1: Taxonomy of LLMs, source: Raiaan, M. A. K. *et. al.*, (2024)

2.2 GPT – a type of LLM

GPT is a specific type of LLM developed by OpenAI in 2018, that stands for *Generative Pre-trained Transformer*, where the term *generative* relates to its ability of generating text. Instead, *pre-trained* denotes the extensive training characterized by a huge amount of data, allowing for further fine-tuning¹² to enhance performance for specific purposes. At the core of GPT lies its neural network model, referred to as the “transformer” due to its ability to convert speech into text, text into speech or text into image. The GPT series currently culminates with GPT-4, which has multi-modal capabilities¹³ (Carolan, K. *et. al.*, 2024).

2.2.1 Transformer

The transformer is a crucial component of GPTs, that incorporates machine learning models known as neural networks within its architecture. This building block processes the inputs received, transforming them into outputs through specific mechanisms. To clarify the following analysis, the architecture described below is called “decoder-only transformer”.

As mentioned earlier, this process begins with the input of data, which could be take the form of text, images or audio, requiring conversion into numerical formats to enable the functioning of machine learning algorithms (Raiaan, M. A. K. *et. al.*, 2024).

2.2.1.1 Word embedding

¹² Fine-tuning is the process of further refining a pre-trained model using specific data to optimize its performance for a specific task or domain.

¹³ In this scenario, the model is a LMM (large multi-modal model).

From this requirement arises the process of word embedding, which involves transforming text into single parts of word, or picture into small groups of pixels, or audio into small frame of sounds. These single units are referred to as “tokens” that are associated to a single unique array of values, known as “input embeddings” (Raiaan, M. A. K. *et. al.*, 2024). Subsequently, the input data is converted into a sequence of numerical vectors, forming a matrix, where the columns represent the “tokens” (previously described) and the rows represent the features or dimensions of the embedding space (Turner, R. E., 2023).

To ensure that each “token” is linked to a single unique numerical vector, it is necessary a sort of vocabulary that is known as “embedding matrix” (usually represented by W_E). This matrix contains representations of almost all possible “tokens” in the form of arrays, obtained through prior training on a dataset¹⁴.

A visualization of this process is provided by the figure 2.2.

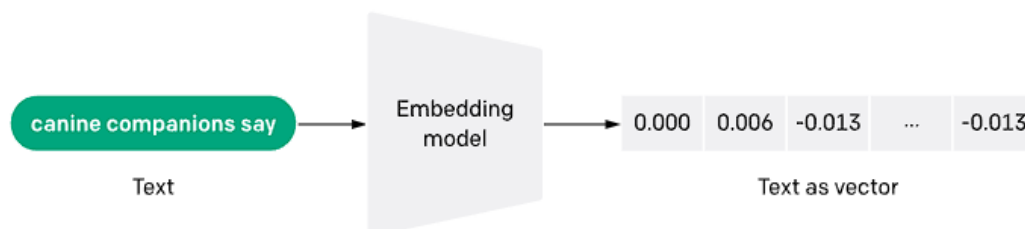


Figure 2.2: Embedding process, source: OpenAI (2024)

Once the input is transformed into a numerical matrix, another challenge must be addressed. Indeed, it is important to convey to the machine learning algorithm the positions of the “tokens” within the text, image, or audio because the meaning can vary based on their positions despite the tokens remaining the same. For this purpose, a number must be assigned (so that the algorithm can read it) to store

¹⁴ to better understand, see more on: <https://petuum.medium.com/embeddings-a-matrix-of-meaning-4de877c9aa27>.

this positional information. This process is called “positional encoding”, which can be executed in several ways, such as employing sine and cosine functions (Vaswani, A., et. al., 2017).

2.2.1.2 Attention mechanism

Once the matrix of the input data is generated, the GPT must interpret the meaning of the “tokens” within the context, because they can have different meanings depending on the context (e.g.: “mouse” could refer the animal or the computer peripheral). To achieve this, the “attention layer” is necessary, which is a component of the transformer. This layer not only assigns meaning to numerical arrays but also transfers information from embedding arrays to another “input embedding”.

The outcome is that the final token of the input matrix contains all the information required to make an accurate prediction of the following token (the output). It is important to note that this information needs to be processed and stored as numbers across several matrixes, otherwise the algorithm won’t understand it.

The process of transferring information and adding meaning to the final token occurs in the so called “attention head” (Elhage, N., et. al., 2021), which is repeated several times, creating a “multi-headed attention” architecture within an “attention layer” of the transformer.

Each “attention head” operates independently and in parallel (so at the same time) within an “attention layer” to generate the output, that is then added back in the “residual stream”¹⁵ (Elhage, N., et. al., 2021). The output is obtained through two important computations carried out by a “query-key” circuit that generates the “attention pattern” and an “output-value” circuit that determines how each token affects the output (Elhage, N., et. al., 2021). These computations are simplified

¹⁵ The residual stream represents the embedding inputs of the original matrix.

(they are represented as calculations for a single “attention-head”) and described below:

- The “query-key” circuit as explained by Elhage, N., *et. al.*, (2021), involves an operation where the “embedding inputs” x are multiplied by the two matrixes, W_Q (“query matrix”) and W_K (“key matrix”), constituted by “tunable parameters”¹⁶ to obtain the vectors called queries q and keys k respectively, as shown in the formula 2.1:

$$q_i = W_Q x_i; \quad k_i = W_K x_i \quad \text{Formula 2.1}$$

Finally, the “attention pattern” A is obtained from the dot product of each q_i and k_i vector, as shown in the formula 2.2:

$$A = q^T k \quad \text{Formula 2.2}$$

These operations, are performed in a single step with the SoftMax function, as illustrated by the formula 2.3:

$$A = \text{softmax}(x^T W_Q^T W_K x) \quad \text{Formula 2.3}$$

The SoftMax function transforms the values of the vectors, which range from negative infinite to infinite, into a probability distribution ranging from 0 to 1¹⁷. In the “attention pattern” A when the value is close to 1, it indicates that the algorithm rewards such token, as it is considered relevant for understanding the context; otherwise, it will be assigned a value close to 0.

¹⁶ The “tunable parameters” are values that can be adjusted to optimize results. They are identified through a training process that relies on a large dataset during the algorithm’s training phase.

¹⁷ This operation is also known as normalization.

Before, this passage another process called “masking” ensures that “tokens” are not affected by subsequent “tokens”. This is possible by assigning a value of negative infinite to these following “tokens” in the matrix, so the SoftMax function transforms them into 0.

To sum up, the “attention pattern governs which token’s information is moved from and to” Elhage, N., *et. al.*, (2021).

- The “output-value” circuit, as explained by Elhage, N., *et. al.*, (2021), is an operation in which there is another matrix W_V (“value matrix”) with tunable parameters that generates vectors, called “values” v , from the “embedding inputs” x through the formula 2.4:

$$v_i = W_V x_i \quad \text{Formula 2.4}$$

Then the “result vectors” r are obtained combining the “attention pattern” A , obtained in the previous circuit, with the “value vectors” v , as shown in the formula 2.5:

$$r_i = \sum_j A_{i,j} v_j \quad \text{Formula 2.5}$$

At this point, the output of a single “attention head” will be obtained through the formula 2.6, that determines the “output vector” h for each token or each “embedding vector” with the dot product between the “output matrix” W_O and the “result vectors” r :

$$h(x)_i = W_O r_i \quad \text{Formula 2.6}$$

According to Elhage, N., *et. al.*, (2021) the result is computed in a single step as shown below by the formula 2.7:

$$h(x) = (A \otimes W_o W_v) \cdot x$$

Formula 2.7

As mentioned previously, the “output vectors” h , obtained by all the “embedding inputs”, are generated by each “attention head” and are then linearly combined with the original “embedding inputs” to update their context.

To strengthen this concept, it has been noted that each “attention head” within an “attention layer” computes in parallel with the other “heads” the previous circuits for each “embedding input”, generating outputs that modify the respective “embedding input” simply by summing the variation deltas obtained.

2.2.1.3 MLP

The attention layer results in an output matrix of parameters, ready to enter into the second type of layer in a transformer: the multi-layer perceptron (MLP) or the feedforward layer. However, before this transition, there is an additional step to complete, known as “Layer Normalization”. This step normalizes each vector within the matrix, which is crucial because in the feedforward layer, where multiple matrix multiplications occur in succession, the values can become either too large or too small, generating instability (Wolfe, Cameron R., 2024). To prevent this issue, it is necessary to normalize vectors using the following formula 2.8 (Wolfe, Cameron R., 2024), which is a part of a process called “layer normalization”:

$$layer - norm(x) = \frac{x - mean(x)}{\sqrt{variance(x) + \epsilon}} \cdot \gamma + \beta$$

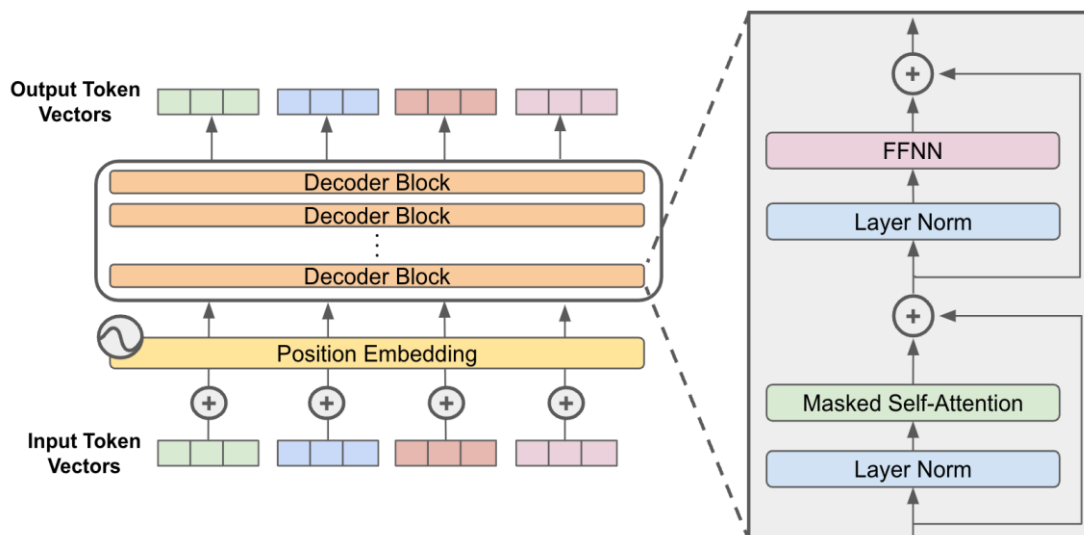
Formula 2.8

Where x represents a token vector, ϵ is a small additive constant, and γ and β are learnable parameters.

After this stage, the normalized token vectors enter the MLP layer, which is a type of neural network algorithm consisting of “neurons” organized into three layers: an input layer, a hidden layer, and an output layer. At this level, there is an activation function¹⁸ that processes the token vectors to identify non-linear correlations between them. Due to its complexity and non-linear nature, the technical details of this process are not included in this thesis. However, after passing through the feedforward layer, the output is added to the residual stream (Wolfe, Cameron R., 2024).

2.2.1.4 Predictions

Once the input has passed through a “multi-headed attention” layer and a “feedforward” layer, it has completed one “transformer block”. However, a GPT model contains many such blocks, that are subsequent to each other, before producing the final output¹⁹. A diagram illustrating a complete decoder-only transformer architecture is shown in figure 2.3.



¹⁸ The activation function used in the GPT series is The GELU according to Phuong, M., & Hutter, M. (2022)

¹⁹ In GPT-3 there are 96 blocks (Brown, T., et. al., 2020).

Figure 2.3: Decoder-only transformer architecture, source: (Wolfe, Cameron R., 2024)

Once the input has been processed by the “transformer blocks”, the model can make the next token prediction. The final output is a matrix of output tokens, which have been updated with context information through several attention and MLP layers. From this matrix, GPT retrieves the last token i (represented as x in formula 2.9) and performs a dot product with the “unembedding matrix” W_U , which is the transposed of the “embedding matrix” W_E (Radford, A. *et. al.*, 2018), to obtain a list of all possible tokens in the “dictionary”, as showed in formula 2.9:

$$\text{logits} = W_E^{-1} \cdot x \quad \text{Formula 2.9}$$

This list contains logits that range from negative infinite to infinite for all possible tokens. These logits are then normalized using a SoftMax function to create a probability distribution that ranges from 0 to 1. The formula 2.10 represents the SoftMax function, which is calculated as the ratio of the exponential of the i -th logit in the list and the sum of the exponentials of all the logit in the array.

$$\text{prob}(\text{token})_i = \frac{e^{(\text{logit}_i/T)}}{\sum_j e^{(\text{logit}_j/T)}} \quad \text{Formula 2.10}$$

In this formula, there is another crucial element, called “Temperature” T . If $T=0$, the algorithm selects the single most probable token (this token is equal to 1, while all the others are 0). Instead, when T tends to be close to infinite, the probability distribution becomes uniform, allowing for random token selection. This leads to greater creativity but also increased randomness in the output (LessWrong, 2024).

With a probability distribution established, a token is chosen based on it. Indeed, the token with the largest probability from the list becomes the next token to be generated (as represented in figure 2.4).

Since tokens are vectors of numbers, they must be converted to strings by mapping each unique vector to a “dictionary”, which converts it back to a word segment (LessWrong, 2024). After prediction, the generated token i -th is added to the input matrix, and the process repeats to predict the $(i+1)$ -th token, continuing until a stopping rule is met (LessWrong, 2024).

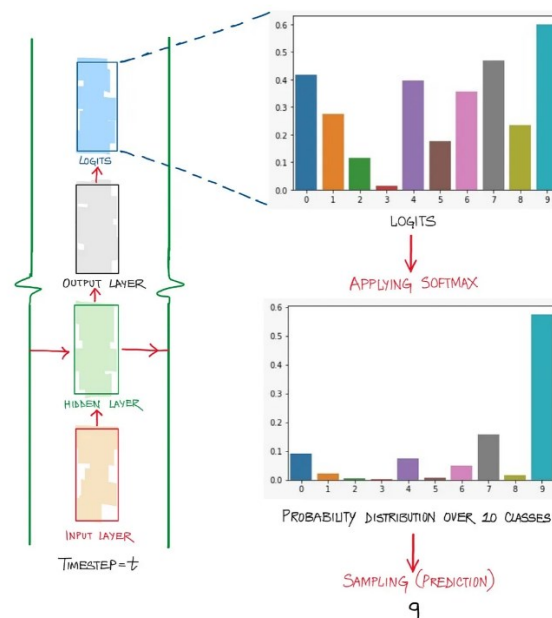


Figure 2.4: Probability distribution and next token prediction. Source: Sharma Harshit, Medium (2024).

2.3 Benefits of LLM

Once that the architecture and work principles of LLMs are examined, it becomes possible to better interpret their potential benefits for human society from several perspectives. However, there is a field in which these models excel: as highlighted by Mollick, E. (2024) in his book, they significantly impact the most

creative jobs. This is made possible by their ability to generate new ideas from existing knowledge in few seconds, simply by playing with probabilities during token prediction.

2.3.1 NLP tasks

LLMs have proven to be exceptionally powerful due to their ability to perform several tasks in natural language processing (NLP), which are the foundation of their success. These tasks primarily include:

- Text generation: a GPT can generate entire texts, articles, and content creation tasks in just few seconds. What's more impressive is its ability to make content so similar to humans that is nearly impossible to distinguish it from human-written text (Imamguluyev, R., 2023). Additionally, it excels in summarising text by capturing the essence of the content. This is possible thanks to the attention mechanisms, as explained in the paragraph 2.2.1.2, enabling the machine to comprehend word context and make predictions based on reliable content.
So, a LLM can significantly save time and resources for human creators while enabling them to produce high-quality work.
- Translations: at the same time, LLMs can perform many other NLP tasks, including translation, employing a more intricate algorithm known as "cross-attention". This method is not explained within the attention mechanism, in the paragraph 2.2.1.2, to preserve simplicity in an already complex process.
- Sentiment analysis: this algorithm can also detect sentiments from text by associating repeated words with human behaviours. Such analysis is precious for market analysis enabling the understanding of customer satisfaction with services or products through review analysis and so, potentially improving the user experience (Imamguluyev, R., 2023).

- Chatbots: another emerging capability of LLMs is their ability to interact with humans through software applications like ChatGPT, Gemini and many others. Here, the model simulates human-like interactions to aid in problem solving, idea generation and more (Imamguluyev, R., 2023). This AI application holds limitless possibilities, impacting numerous jobs and industries. As mentioned in a study conducted by Eloundou, T., *et. al.* (2023), only 34 out of 1016 surveyed occupations (reported in the figure 2.5) are not affected by generative AI (GPT-4) across any task. Mollick, E. (2024) suggests that these are predominantly highly physical jobs, where AI has yet to be fully developed.

Occupations with no labeled exposed tasks

Agricultural Equipment Operators
 Athletes and Sports Competitors
 Automotive Glass Installers and Repairers
 Bus and Truck Mechanics and Diesel Engine Specialists
 Cement Masons and Concrete Finishers
 Cooks, Short Order
 Cutters and Trimmers, Hand
 Derrick Operators, Oil and Gas
 Dining Room and Cafeteria Attendants and Bartender Helpers
 Dishwashers
 Dredge Operators
 Electrical Power-Line Installers and Repairers
 Excavating and Loading Machine and Dragline Operators, Surface Mining
 Floor Layers, Except Carpet, Wood, and Hard Tiles
 Foundry Mold and Coremakers
 Helpers–Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
 Helpers–Carpenters
 Helpers–Painters, Paperhangers, Plasterers, and Stucco Masons
 Helpers–Pipelayers, Plumbers, Pipefitters, and Steamfitters
 Helpers–Roofers
 Meat, Poultry, and Fish Cutters and Trimmers
 Motorcycle Mechanics
 Paving, Surfacing, and Tamping Equipment Operators
 Pile Driver Operators
 Pourers and Casters, Metal
 Rail-Track Laying and Maintenance Equipment Operators
 Refractory Materials Repairers, Except Brickmasons
 Roof Bolters, Mining
 Roustabouts, Oil and Gas
 Slaughterers and Meat Packers
 Stonemasons
 Tapers
 Tire Repairers and Changers
 Wellhead Pumpers

Table 11: All 34 occupations for which none of our measures labeled any tasks as exposed.

Figure 2.5: 34 Occupations without exposed tasks to generative AI, source: Eloundou, T., *et. al.* (2023)

2.3.2 Human + AI

The large language model's ability to perform NLP tasks, as outlined in the paragraph 2.3.1, offers a significant advantage for humans to enhance their daily tasks and jobs. Generative AI represents a form of co-intelligence that humans should effectively leverage, viewing it not as an independent mind but as an extension of human capabilities (Mollick, E., 2024). To prove the benefits of cooperation between humans and generative AI systems like ChatGPT and DALL-E, a study conducted by Noy, S., & Zhang, W. (2023) evaluated the effects of incorporating generative AI into a poll of 444 professionals, which is asked to perform various writing tasks related to their daily work.

The study revealed that ChatGPT could boost productivity in two ways: by either substituting for workers in completing tasks, thus saving time while still delivering satisfactory results, or by complementing humans in brainstorming and drafting activities (Noy, S., & Zhang, W., 2023). Of particular interest is the finding that works generated by ChatGPT received lower grades than those edited by humans, suggesting that human intervention adds value. Furthermore, a more significant outcome is that ChatGPT improves the quality of work produced by individuals with lower skill levels, concurrently reducing the time required for such tasks. Instead, highly skilled individuals maintained their advantage in terms of quality (with lower improvements after using ChatGPT) over less skilled individuals who utilized ChatGPT, and they have gained a large contribution on the reduction in tasks execution time (Noy, S., & Zhang, W., 2023).

The figure 2.6 illustrates the overall results regarding improvements in both quality and time in the tasks.

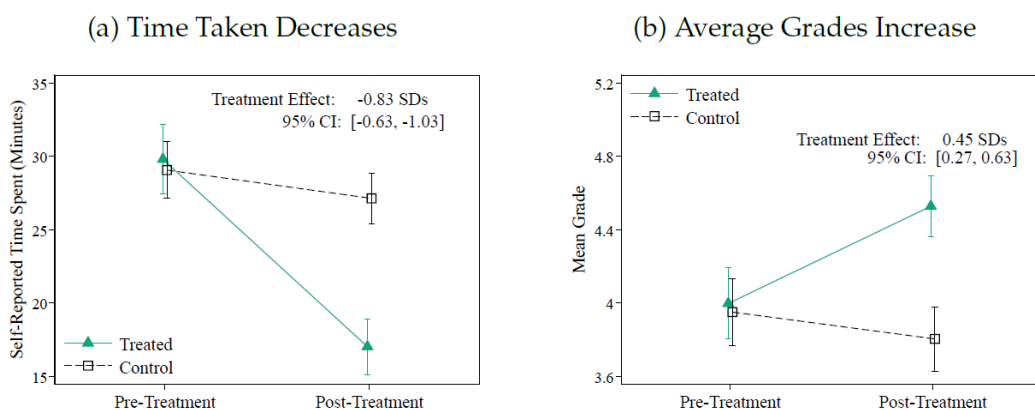


Figure 2.6: The chart on the left demonstrates with the green line the reduction of the time taken to execute tasks before and after the use of ChatGPT. The chart on the right demonstrates with the green line the improvement of grades obtained by people before and after the use of ChatGPT.

Source: Noy, S., & Zhang, W. (2023)

2.4 Drawbacks of LLM

The large language model, as well as the generative-AI in a broader sense, lives a moment of huge improvements but also characterized by issues and potential problems. An attempt to summarize the most important and discussed issues are reported in the following paragraphs.

2.4.1 Alignment

While generative AI models are remarkable for their creative abilities, this same feature can pose critical issues in human society. Indeed, when a LLM is capable of freely generating any kind of content, numerous ethical issues arise due to the misalignment with of the algorithm human values. For instance, as reported by Mollick, E. (2024), there could be the possibility that generative AI can provide

detailed descriptions on how to commit a harmful act such as killing people or constructing bombs, even in a creative manner.

This situation is possible since these algorithms have not a real consciousness, as they are designed to only predict the next token, rather than to discern between right and wrong. Consequently, these systems lack in sharing the human ethics and morality. For this reason, a solution must be found, which is partly addressed by major companies involved in LLMs development. Such solution is the Reinforcement Learning from Human Feedback (RLHF), an algorithm based on human-AI interaction. This process involves supervised training where humans provide feedback on the model's responses, ranging from positive to negative values. This feedback enables the model to replicate answers considered positive in same context, and to avoid certain answers when they are considered as negative. Results from this approach demonstrate to be promise, achieving greater helpfulness and harmlessness compared to original models, while maintaining the same performance levels (Bai, Y., *et. al.*, 2022). However, it is important to note that RLHF is not a perfect solution, because some errors can still occur, and scalability remains a concern due to the extensive human feedback required. Indeed, this model "typically uses at least ten of thousands of human feedback labels" (Bai, Y., *et. al.*, 2022).

In their paper ("Constitutional AI: Harmless from AI Feedback") Bai, Y., *et. al.*, (2022) present an alternative to RLHF, known as Constitutional AI (CAI). This method aims to enable the "scaling supervision"²⁰ for developing a harmless and helpful²¹ AI assistant without relying on human feedback for harmlessness evaluation. This is made possible thanks to a priori human intervention, involving the formulation of a set of principles that will govern the AI behaviour. These principles replace human feedback with Constitutional AI feedback that evaluate the AI assistant responses. This method demonstrates its efficacy from the results

²⁰ Scaling supervision is intended to be the technique that enables humans to leverage AI efficiently in supervising AI processes.

²¹ There is a trade-off between being harmless and being helpful, as AI often tends to respond with "I don't know", to avoid causing harmful content. But this answer is helpless. (Bai, Y., *et. al.*, 2022)

illustrated in figure 2.7, particularly in creating AI assistants that are less harmful while maintaining a given level of helpfulness.

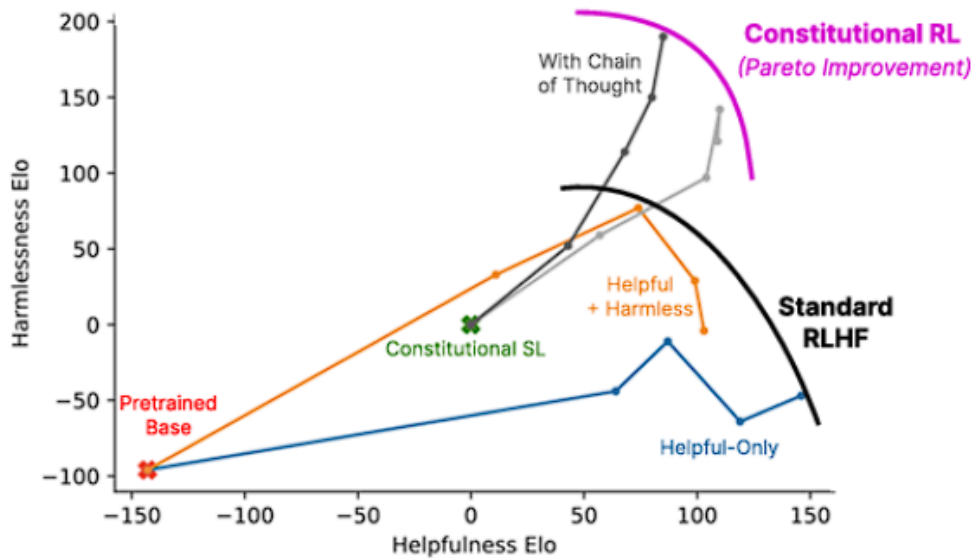


Figure 2.7: Harmlessness vs Helpfulness Elo scores, source: (Bai, Y., *et al.*, 2022)

2.4.2 Hallucinations

The creative generation of tokens also impacts the ability of the LLMs to produce reliable content. Indeed, LLMs suffer from “hallucinations”, which means that these models generate false or non-factual information. Ji Z. *et al.* identifies two types of hallucinations in LLMs: “Intrinsic Hallucinations”, which involve deviations from the source input (e.g.: providing answers that differ from reality, like “the World War 2 started in 1890”), and “Extrinsic Hallucinations”, which involve deviations from world knowledge (e.g.: generating unverifiable output, such as “Italy dominates the economy in 2050”).

Hallucinations are mainly caused by two sources: data and training /inference (Ji, Z., *et al.*, 2023). The first case occurs when there is a mismatch between the source and reference in the dataset, which can arise from heuristic data collection

methods or from the intrinsic nature of the Natural Language Generation (NLG). The second case is more complex, involving choices in training methods and model selection of the transformer. For instance, if the transformer model is inadequate, it may fail to understand the context and consequently generating hallucinations. Alternatively, the model may prioritize internal matrixes parameters over of input data during output generation.

Mollick, E. (2024) argues that this is a serious problem since generative AIs are capable of justifying and convincing humans that wrong or unreal facts are true. This is because LLMs, especially chatbots, are designed to provide responses even when the user's prompt lacks coherence. Moreover, identifying hallucinations can be challenging as models generate highly convincing responses (Ji, Z., *et. al.*, 2023). When this happens, real problems arise. Therefore, addressing this issue requires solutions such as the most adopted RLHF method (explained before) or enhancing the quality of input datasets during pre-training among other approaches. Anyway, even if there are several solutions that mitigate this problem, it persists and poses an increasing challenge with the emergence of new large multi-modal models (LMMs) (Ji, Z., *et. al.*, 2023).

CHAPTER 3 – Customized GPT for Personas

In this chapter, there is an attempt to enhance service design activities through the utilization of large language models to create a customized GPT tailored to support the creation of personas, a service design tool introduced in chapter 1. This GPT allows users to create this tool more quickly by facilitating the creation process, potentially generating the desired outcomes and offering insights for further analysis. This is possible thanks to GPT-4, a large multi-modal model (LMM)²² that enables users to create a personalized GPT, by incorporating specific instructions, knowledge, actions, and settings²³, that can perform specific tasks. In the following paragraphs the creation and experimentation process is described, demonstrating its usefulness in a step-by-step conversation.

3.1 Persona Builder

The first GPT is employed to support the creation of personas, which proves beneficial in service design activities because it enables the creation of tangible representations of stakeholders. Therefore, with the goal of assisting a multi-disciplinary service design team in this creation, specific instructions are provided to GPT. These instructions explain to GPT how to behave, its functionalities and behaviours to avoid (OpenAI, 2024).

To ensure clarity in the following presentation, it is essential to clarify some aspects. Firstly, in order to avoid confusion with other GPTs the name of this one

²² GPT-4 is a paid platform. This platform works as a Large Multi-Modal Model but in this thesis is used as a Large Language Model for text-to-text generation.

²³ Instructions, actions, knowledge and settings can be integrated in the background of the GPT by inputting text, code or file inside of it.

is “Persona Builder”. Secondly, instructions and prompts given to Persona Builder are written inside a light grey box, while Persona Builder responses appear in a light blue box.

3.2 Instructions and Knowledge

As stated before, instructions are necessary to guide Persona Builder to provide the most accurate answers possible, which means not only delivering the final outcome (personas) but also guiding the team on the right path.

To enable this phase, it is essential to input background information about Persona Builder’s intended role. Therefore, the first step involves giving context regarding its purpose, as follows:

Persona Builder operates as an expert consultant in service design, providing users with tools to create detailed personas based on real user data. It analyzes data from interviews, surveys, and reviews to detect patterns for grouping into personas and offers visual representations. Additionally, it suggests interview questions for data collection on new personas and incorporates insights from multiple documents on creating and using personas effectively. This GPT guides users through defining, structuring, and refining character profiles with a focus on empathy and authenticity, aligning closely with project needs.

This text is generated by GPT Builder, another GPT that is made available by OpenAI to set the context of any GPT starting from the user requests. In this case, it is asked to act as an expert consultant in service design to assist users in personas creation activities.

Now, Persona Builder understands its role and its goal, but it is crucial to further clarify the topic of this chatbot to enhance its knowledge of this specific subject. For this purpose, GPT provides the option to input files that will be used by Persona Builder to train itself. In this case, several selected files from literature about personas are uploaded to the model: some files contain theoretical concepts on personas, one file explains the personas methodology, and one file provides an example of personas. This knowledge is not mandatory for GPT creation; indeed, the model can work without such input takes, drawing information from the wide dataset provided by OpenAI.

3.3 Test phase

In this phase, there is a practical demonstration of the ability of GPT's ability through the creation of personas both with and without inputs. Moreover, a final review of the result obtained is requested from Persona Builder to assess its critical ability and its improvement efforts on the personas provided. All these steps are repeated twice in the following paragraphs: once using Persona Builder trained with specific knowledge and the other time using Persona Builder trained without specific knowledge (so, trained only on the dataset provided by OpenAI). This is done with the goal of understanding the differences in behaviour and outcomes of the GPT.

The two tests are conducted in parallel using two identical GPTs, differing only in knowledge. Therefore, for a more comprehensive description, the GPT with knowledge is called Persona Builder K, while the GPT without knowledge is called Persona Builder WK. This distinction is made based on the fact that Persona Builder models learn from conversations, and this can bias the analysis if conducted with the same GPT.

In the test phase, it is assumed that personas need to be created for a specific company that offers a maintenance service for electrical systems in industrial and civil buildings and operates in a regional area identified as Padua, Italy.

3.3.1 Creation without inputs

The first test phase involves the creation of personas without providing a dataset to GPT, and this means a very concise prompt, as shown below.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience. Please, generate five personas.

The goal of this test is to assess the ability of the GPT to generate personas with limited information, while accepting a certain level of bias due to missing data. This is interesting because it can help the potential team generate new ideas from practical examples like these, which are also focused on the specific field needed.

3.3.1.1 Persona Builder K

Persona Builder K answered in a few seconds with five personas, as shown below. The response is integrated with a second request regarding the generation of a visual representation of all the five personas thanks to DALL-E, an optional capability available in GPTs from OpenAI.

Persona 1: Residential Owner - Giovanna Rossi

Demographics:

- Age: 45
- Occupation: School teacher
- Family Status: Married with two kids



Needs & Goals:

- Reliable maintenance services for home electrical systems
- Quick response to issues affecting daily life (e.g., power outages)

- Cost-effective services

Behavior Patterns:

- Prefers services recommended by neighbors and friends
- Usually takes recommendations from her husband
- Books services in advance for major repairs

Frustrations:

- Delays in service responses
- Unexplained technical jargon

Persona 2: Industrial Manager - Marco Bianchi

Demographics:

- Age: 50
- Occupation: Plant Manager
- Family Status: Married, one grown-up child



Needs & Goals:

- Seamless operation of electrical systems in the plant
- Periodic maintenance and regular inspections
- Long-term contracts for service reliability

Behavior Patterns:

- Prioritizes vendors with comprehensive industrial maintenance experience
- Values transparency and prefers digital invoicing
- Often seeks expert advice on upgrading equipment

Frustrations:

- Poorly skilled technicians
- Lack of communication during emergencies

Persona 3: Small Business Owner - Valentina Ricci

Demographics:

- Age: 38
- Occupation: Café Owner
- Family Status: Single

Needs & Goals:

- Minimal disruption to the café's operation
- Cost-effective solutions for small businesses
- Regular maintenance checks

Behavior Patterns:

- Books services only when problems arise
- Compares multiple quotes before deciding
- Relies heavily on online reviews

Frustrations:

- Lack of weekend support
- Hidden costs and fees



Persona 4: Property Manager - Luca Moretti

Demographics:

- Age: 55
- Occupation: Property Manager
- Family Status: Married, two grown-up children

Needs & Goals:

- Reliable maintenance for multiple properties
- Custom solutions for different property types
- Scalable service contracts

Behavior Patterns:

- Outsources services based on previous experiences
- Prioritizes companies with a broad service portfolio
- Maintains a preferred vendor list

Frustrations:

- Lack of coordination across multiple sites
- Slow response times for emergency repairs



Persona 5: Technical Engineer - Elena Verdi

Demographics:

- Age: 32
- Occupation: Electrical Engineer
- Family Status: Engaged

Needs & Goals:

- Highly technical maintenance and repair services
- Comprehensive reporting on system status
- Advanced solutions for complex issues

Behavior Patterns:

- Focuses on technical specifications and vendor certifications



- Prefers online communication for scheduling
- Reviews service reports in detail

Frustrations:

- Lack of attention to detailed technical requests
- Slow response in remote locations

The five personas appear quite good, showing all the features necessary for further analysis and are relevant to the context provided. They present demographics to personify personas enhancing the team comprehension and each has an Italian name that align with the company's operating area. However, these models reflect what has been said in the provided knowledge documentation, especially in three categories: needs and goals, behaviour patterns, and frustration. This is not necessarily wrong, but it shows how the GPT primarily values the content provided rather than the pre-existing dataset. Even when trying to restart the conversation with Persona Builder K, using the same prompt, the answer remains similar to the previous one in terms of personas components (demographics, goals, behaviours and frustrations), but with more information integrated.

3.3.1.2 Persona Builder WK

The same prompt is given to Persona Builder WK, which submits the following sentence. Here too, the GPT is asked to provide a visual representation of the personas by using DALL-E.

Persona 1: Residential Homeowner - Maria Rossi

- **Age:** 45
- **Occupation:** Marketing Manager
- **Family Status:** Married with two kids
- **Location:** Suburban Padua
- **Goals:** Ensure home safety, efficient electrical systems for family comfort.



- **Pain Points:** Limited time to oversee maintenance, wary of hidden costs.
- **Preferred Communication:** Email and phone for detailed discussions.
- **Service Expectations:** Prompt scheduling, clear cost breakdowns, safety assurance.

Persona 2: Industrial Facility Manager - Luca Bianchi

- **Age:** 38
- **Occupation:** Facility Manager for a manufacturing plant
- **Family Status:** Married, no children
- **Location:** Industrial area near Padua
- **Goals:** Ensure zero downtime, cost-effective maintenance for large-scale systems.
- **Pain Points:** High stakes of system failures, balancing maintenance budget.
- **Preferred Communication:** Detailed reports, in-person meetings.
- **Service Expectations:** Quick response times, proactive maintenance suggestions, transparent pricing.



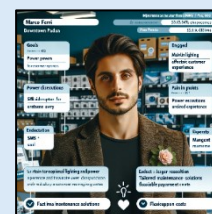
Persona 3: Property Manager - Giulia Conti

- **Age:** 52
- **Occupation:** Property Manager for multiple residential buildings
- **Family Status:** Single
- **Location:** Central Padua
- **Goals:** Ensure tenant satisfaction, maintain property value.
- **Pain Points:** Coordinating maintenance across multiple properties, unpredictable issues.
- **Preferred Communication:** Email for scheduling, phone for emergencies.
- **Service Expectations:** Reliable scheduling, comprehensive maintenance plans, emergency support.



Persona 4: Retail Business Owner - Marco Ferri

- **Age:** 33
- **Occupation:** Owner of a retail electronics store
- **Family Status:** Engaged
- **Location:** Downtown Padua



- **Goals:** Maintain optimal lighting and power for business operations.
- **Pain Points:** Power disruptions affecting customer experience, managing costs.
- **Preferred Communication:** SMS for updates, email for detailed information.
- **Service Expectations:** Fast issue resolution, tailored maintenance solutions, flexible payment options.

Persona 5: Renovation Contractor - Elena Verdi

- **Age:** 40
- **Occupation:** Contractor specializing in home renovations
- **Family Status:** Married with three children
- **Location:** Outskirts of Padua
- **Goals:** Seamlessly integrate electrical systems in renovation projects.
- **Pain Points:** Coordinating with subcontractors, adhering to project timelines.
- **Preferred Communication:** Phone and in-person for quick coordination.
- **Service Expectations:** Flexible scheduling, adherence to project timelines, detailed cost estimates.



This time, the personas lose the previous structure, as expected, but maintain the same essential content like demographics information, goals, pain points. However, in this situation, there are other elements that are very useful in the analysis of customer experience like expectations and communication channels. This probably suggests that Persona Builder WK is more flexible in determining the information included in personas because it draws solely from the wide dataset without focusing on specific content.

Overall, both GPTs works well in terms of outcomes because, in very few seconds they generate what is asked in a satisfactory way, given that both rely on very limited input data. This, of course, limits the usefulness of the tool because it is highly biased from a real situation, but this process can be a precious source for idea generation in design thinking activities.

3.3.2 Creation with inputs

After this first creation attempt, it is the moment to test the creation of personas in another context aimed at enhancing the accuracy of outcomes. Specifically, it is assumed that the same company decides to collect some data from its customers through a specific dataset, which is a set of interviews conducted to random customers of the company. In this case, interviews are simulated using the generative ability of LLMs by prompting the following sentence to generate questions to ask customers in order to collect data for a specific purpose: creating personas.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience. Generate six questions to gather information from customers, including one to introduce customer in terms of age, name, and other demographic information. These questions will be crucial for developing detailed customer personas.

The prompt is given to both Persona Builder K and Persona Builder WK, which returned the following questions.

Questions generated by Persona Builder K:

1. "What is your name, age, and occupation?"
2. "What specific electrical system maintenance services do you typically require, and how often?"
3. "How would you describe your experience with electrical system maintenance services you've used in the past?"

4. "What challenges or frustrations have you experienced with electrical system maintenance services?"
5. "Preferred Communication: How do you prefer to communicate with service providers (e.g., phone, email, online chat)?"
6. "What factors are most important to you when choosing an electrical system maintenance service?"

Questions generated by Persona Builder WK:

1. "Could you please introduce yourself with your name, age, and the type of building where you reside or work (e.g., residential or industrial)?"
2. "How would you describe your experience with our electrical system maintenance services, and what specific areas do you believe we could improve upon?"
3. "What specific electrical system maintenance needs or preferences do you have that are crucial for your residential or industrial building?"
4. "How often do you require maintenance services for your electrical systems, and what budget do you usually allocate for these services?"
5. "What is your preferred way of receiving updates and communication from us regarding maintenance schedules or emergencies?"
6. "Can you describe a recent experience when you required our services, including the steps you took before contacting us and the overall journey you had?"

The generated questions above are used to generate random customers interviews using GPT-4 with the following prompt. The generated outputs (30 interviews for each group of questions, a total of 60) are provided in the Appendix.

You represent customers for a company that offers maintenance services for electrical systems in residential and industrial

buildings mainly located in Padua, Italy. Simulate 30 interviews using the following questions:

...here are reported the groups of questions one at time...

Once the answers from Persona Builder K's questions are collected, they are given back to it²⁴ with the goal of synthetizing them into personas. The following prompt is provided to the two GPTs.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience. Please, analyse the provided interviews of company's customers and generate five personas.

3.3.2.1 Persona Builder K

The answers of Persona Builder K are presented below, and they are supplemented with the requests for providing a visual representation of personas using DALL-E.

Persona 1: Marco Rossi (Industrial Manager)

- **Age Range:** 40-50
- **Profession:** Factory/Facility Manager
- **Needs:** Routine inspections (quarterly or biannual)
- **Challenges:** Inconsistent service, delays, transparency issues
- **Preferences:** Phone for urgent matters, email for documentation



²⁴ Interviews are provided as attachments.

- **Priorities:** Promptness, reliability, professionalism, and cost

Persona 2: Elena Bianchi (Real Estate Professional)



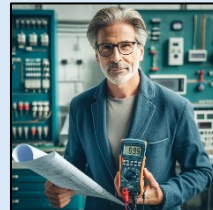
- **Age Range:** 30-40
- **Profession:** Real Estate Agent, Property Manager
- **Needs:** Inspections for residential properties (during turnover or biannual)
- **Challenges:** Scheduling delays, unprepared technicians
- **Preferences:** Email for communication
- **Priorities:** Accuracy, punctuality, clear communication, and cost

Persona 3: Luca Conti (Hospitality/Retail Manager)



- **Age Range:** 50+
- **Profession:** Hotel/Retail Manager
- **Needs:** Quarterly maintenance
- **Challenges:** High costs, scheduling delays
- **Preferences:** Phone for urgent communication
- **Priorities:** Responsiveness, expertise, cost-effectiveness

Persona 4: Giuseppe Esposito (Technical Specialist)



- **Age Range:** 40-60
- **Profession:** Electrical Engineer, Architect, Building Supervisor
- **Needs:** Annual/Biannual checks
- **Challenges:** Mixed service quality, lack of transparency in pricing
- **Preferences:** Phone
- **Priorities:** Competence, transparency, professionalism

Persona 5: Chiara De Luca (Administrator)



- **Age Range:** 40-50
- **Profession:** School/Office Administrator
- **Needs:** Annual/Biannual inspections
- **Challenges:** Scheduling issues, high costs
- **Preferences:** Email and phone for communication
- **Priorities:** Reliability, cost, coordination

From these personas it is possible to understand that the structure remains similar to personas generated without inputs, with integrations of new aspects present in the interviews. For instance, a very clear difference is the presence of communication channels in behaviours, which were not present previously. Moreover, these personas are more synthetic than before, may be this is due to the pattern of interviews which are quite shorts. Anyway, results are better in terms of outcome, because the description is less generic and more focused on data provided, suggesting that with real data, results will be even better.

3.3.2.2 Persona Builder WK

The same prompt is also used for Persona Builder WK, which generates the following personas, supplemented with the request to produce a visual representation for each of them, using DALL-E.

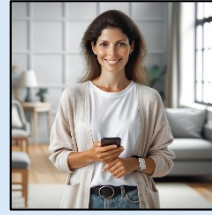
Persona 1: "Industrial Manager Marco"

- **Age:** 42
- **Location:** Industrial facilities
- **Role:** Manager of industrial facilities and warehouses
- **Budget:** €2000 - €10000 annually
- **Maintenance Needs:** Heavy machinery, power distribution panels, equipment wiring
- **Preferred Communication:** Email for updates, phone calls for emergencies
- **Pain Points:** Faster emergency response times, transparency on costs, updates on system upgrades
- **Customer Experience:** Prioritizes quick emergency services, proactive maintenance checks, transparency



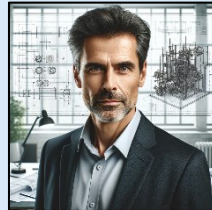
Persona 2: "Homeowner Lucia"

- **Age:** 34
- **Location:** Residential houses and apartments
- **Role:** Homeowner in residential buildings
- **Budget:** €120 - €250 annually
- **Maintenance Needs:** Circuit breakers, surge protectors, switches, outlets
- **Preferred Communication:** SMS notifications for updates
- **Pain Points:** Shorter appointment windows, weekend availability, proactive maintenance suggestions
- **Customer Experience:** Prefers proactive checks, values quick appointment times, expects flexibility



Persona 3: "Factory Owner Andrea"

- **Age:** 50
- **Location:** Factories and manufacturing plants
- **Role:** Factory owner or overseer
- **Budget:** €5000 - €12000 annually
- **Maintenance Needs:** Machinery wiring, circuit boards, heavy machinery
- **Preferred Communication:** Emails for updates, phone calls for emergencies
- **Pain Points:** Faster response times, transparency on maintenance plans
- **Customer Experience:** Wants faster emergency services, thorough inspections, clear communication



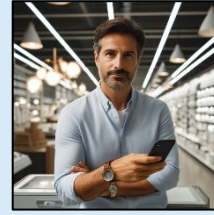
Persona 4: "Commercial Property Owner Giuseppe"

- **Age:** 61
- **Location:** Commercial buildings
- **Role:** Owner of commercial properties
- **Budget:** €2500 - €5000 annually
- **Maintenance Needs:** Emergency lighting, safety codes, building electrical grid
- **Preferred Communication:** Phone calls for all updates
- **Pain Points:** Updates on system upgrades, transparency on fees
- **Customer Experience:** Needs timely updates, requires in-depth system assessments, expects reliable service



Persona 5: "Retail Manager Riccardo"

- **Age:** 48
- **Location:** Retail stores
- **Role:** Manager of retail stores
- **Budget:** €1500 - €3000 annually
- **Maintenance Needs:** Lighting fixtures, circuit breakers, control panels
- **Preferred Communication:** Phone calls for all updates
- **Pain Points:** Quick response to emergencies, flexibility in scheduling, clarity on maintenance plans
- **Customer Experience:** Values quick emergency response, clear quotes, transparent communication



In these personas, the result is the same as the other GPT in terms of documentation influence. Here too, there is evidence of this in the budget, that are information provided in the interviews but were missing in the generation without inputs. This element is not irrelevant, because it can affect a lot the service offered by the company. The other points are improved as well, but the content remains quite similar to the previous personas.

3.3.3 Insights and Improvements

In this step, GPTs are asked to analyse personas generated in paragraph 3.3.2 but by switching the GPTs, in order to limit bias, even if it remains challenging to avoid it. So, personas generated with Persona Builder K are subjected to analysis of Persona Builder WK and vice versa. This analysis is general, to avoid a deeper analysis for each persona, because the step aims to understand the critical abilities of GPTs and their ability to generate new improvement ideas.

To complete this task, another prompt is provided as follows.

Assess the personas provided in the attachment, providing a general evaluation of them, and offering general suggestions for improvement.

3.3.3.1 Persona Builder K

The response of Persona Builder K is presented below.

General Evaluation

1. Clarity and Detail: The personas are well-defined with clear demographic and psychographic information which aids in understanding their motivations and challenges. This detail is crucial for empathizing with the personas and designing solutions tailored to their needs.

2. Representation of User Goals: Each persona appears to have distinct goals and challenges that are relevant to their roles and life situations. This specificity is good as it helps in designing targeted interventions or solutions.

3. Relevance to Business or Project Goals: The personas seem aligned with likely business or project goals, suggesting that they were created with a clear understanding of the project's scope. This alignment is essential for ensuring the personas are useful in practical scenarios.

4. Diversity and Inclusivity: The personas cover a range of ages, backgrounds, and professional statuses. This diversity can ensure that the product or service is designed inclusively, considering various user needs.

General Suggestions for Improvement

1. Avoiding Stereotypes: Ensure that the personas avoid stereotypes, particularly with demographic details like age, gender, and ethnicity, which can sometimes lead to assumptions that may not represent user behavior accurately. It's crucial to base these aspects on data rather than assumptions.

2. Dynamic and Evolving Personas: Personas should not be static. They need to evolve as more user data is collected. Regular updates to the personas will ensure they remain relevant and reflect changes in user behavior and market conditions.

3. Integration of Real User Quotes and Stories: Including direct quotes from user interviews or surveys can add depth to the personas and make them more relatable. These stories and quotes can bring personas to life, providing deeper insights into their motivations and frustrations.

4. Validation with Real Users: It is beneficial to validate the personas through user testing or feedback to ensure they accurately reflect real user needs and behaviors. This step can also help identify any gaps in the personas or areas that might have been overlooked.

5. Creating Fewer, More Focused Personas: While having diverse personas is beneficial, too many personas can make it difficult to focus design efforts effectively. Consider consolidating similar personas or focusing on fewer, critical ones that represent the majority of your target audience.

3.3.3.2 Persona Builder WK

The response of Persona Builder WK is presented below.

General Evaluation

1. Detailed Professional Context: The personas, such as Marco Rossi (Industrial Manager) and Elena Bianchi (Real Estate Professional), have clear professional backgrounds, which are helpful in understanding their environments and needs.

2. Diverse Needs and Challenges: The personas effectively showcase a variety of needs and challenges relevant to their professions. For instance, Luca Conti (Hospitality/Retail Manager) faces high costs and scheduling delays, which are realistic issues in such industries.

3. Communication Preferences and Priorities: Each persona has distinct communication preferences and priorities, which is critical for tailoring service approaches. For example, Giuseppe Esposito (Technical Specialist) prefers phone communications and values competence and transparency.

Suggestions for Improvement

1. Demographic Depth: Adding more demographic details like educational background, socio-economic status, or even

hobbies could make each persona feel more realistic and relatable. These details can influence a persona's preferences and decision-making processes.

2. Behavioral Traits: Include behavioral traits such as decision-making styles (e.g., data-driven, intuitive), personality traits (e.g., introverted, extroverted), or conflict resolution preferences. These can help in understanding how to interact with them more effectively.

3. Quotes and Stories: Adding direct quotes from or about the personas, or brief anecdotes illustrating a typical day or a common problem could enrich their profiles. This narrative element can foster empathy and a deeper understanding of each persona's context.

4. Technology Use: Expanding on how each persona interacts with technology (specific apps, devices, or platforms they use frequently) could provide insights into how best to reach and engage them.

5. Goals and Motivations: More explicitly stating what each persona aims to achieve in their professional and possibly personal life could help in aligning services and communications to these goals.

3.4 Observations

The test phases highlight the most important feature of LLMs which is their generative ability. In two different contexts, they have proven capable of generating the requested output with a good level of accuracy even though they were limited by the non-realistic data. This is a crucial point for better implementation, because GPTs are able to incorporate the content provided into tool generation to enhance the results. This issue is also outlined by GPTs themselves in the last test stage, demonstrating their stunning ability to provide valuable feedback.

The two GPTs, in all the tasks computed in parallel, have demonstrated to be very similar in solving task because the differences are marginal, and they do not affect the success of the result. However, based on the previous analysis, it is possible to assess that a GPT can be limited to a certain field of information by inputting

specific data. This can be exploited in certain contexts where results are requested in a certain manner, such as with a specific structure or content.

To conclude, what is clear is that LLMs are beneficial for ideation phase, because they can support a potential service design team in just few seconds by presenting a concrete, valuable example of what the final outcome could be and providing suggestions to guide a disoriented or inexperienced team onto the right path.

3.5 Persona Builder SK

For the last part of the chapter is provided an example of real application of a GPT with realistic data in order to assess if Persona Builder improves its ability using specific content. Indeed, in this case it is created another GPT, with the same instructions as before and the same content used in Persona Builder K, but this time additional documentation related to the company's industry is provided to build a Specific Knowledge. For this reason, such GPT is called Persona Builder SK.

Once, the GPT has been created the following prompt is given to it to generate personas based on a document provided as an attachment. This document is an Excel file containing all the past maintenance interventions made by the company.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience. Please, analyse the provided dataset of customers and generate five personas based on it.

The response obtained is reported below, and integrated with the second request to Persona Builder SK to generate a visual representation of each persona created using DALL-E.

Persona 1: The Proactive Residential Owner

- **Name:** Marco Bianchi
- **Age:** 45
- **Property:** Residential
- **Profile:** Marco is proactive about maintaining his home's electrical system to ensure safety and efficiency. He schedules regular check-ups and prefers services that offer thorough inspections and clear explanations.
- **Key Needs:** Reliability, high quality of work, and clear communication.
- **Preferred Communication:** Phone or app notifications.



Persona 2: The Cost-Conscious Small Business Owner

- **Name:** Sara Rossi
- **Age:** 38
- **Property:** Small industrial (local bakery)
- **Profile:** Sara runs a small bakery and is very cost-conscious due to her tight budget. She looks for maintenance services that offer good value for money and can respond quickly to emergencies to prevent business disruptions.
- **Key Needs:** Cost efficiency, speedy response, and minimal disruption to business operations.
- **Preferred Communication:** Text messages or email.



Persona 3: The Tech-Savvy Property Manager

- **Name:** Luca Verdi
- **Age:** 52
- **Property:** Multiple residential and commercial properties
- **Profile:** Luca manages multiple properties and values technological solutions that can provide efficient management and maintenance. He prefers services that use modern technology to diagnose and resolve issues promptly.
- **Key Needs:** Technological integration, detailed service reports, and efficiency.
- **Preferred Communication:** Email or a dedicated service app.



Persona 4: The Eco-Conscious Homeowner

- **Name:** Giulia Conti
- **Age:** 34
- **Property:** Residential
- **Profile:** Giulia is environmentally conscious and prefers using renewable energy solutions like solar panels. She values services that are knowledgeable in modern and eco-friendly systems and practices.
- **Key Needs:** Expertise in renewable technologies, sustainability, and reliability.
- **Preferred Communication:** App notifications or phone calls.



Persona 5: The Industrial Facility Supervisor

- **Name:** Antonio Ferri
- **Age:** 49
- **Property:** Large industrial facility
- **Profile:** Antonio supervises a large industrial facility and needs a maintenance service that can handle complex electrical systems and provide quick responses to minimize downtime.
- **Key Needs:** Availability of service personnel, quick resolution, and high-quality work.
- **Preferred Communication:** Direct phone calls or emails.



The result obtained is impressive for many reasons. First, it represents clear evidence that the personas are no longer merely invented but are based on real data. This can be seen in the personas created, because none is unrealistic or improbable (for example, technical engineers, like persona 5 in paragraph 3.3.1.1 or persona 4 in paragraph 3.3.2.1, or owners of retail electronic stores, which are clearly biased from the topic).

Moreover, all of them present interesting and plausible situations with a clear distinction between the residential and the industrial users, further differentiated between small and large companies.

It is also interesting to note Luca Verdi, a persona which is common and peculiar in such industry. Indeed, he is a multi-property owner who has specific needs.

To conclude, Persona Builder SK is the best of all the three for the accuracy of the results obtained, and it demonstrates that it is possible to use a very easy

way, even achieving nearly final results, over the ideation process already outlined by the previous GPTs.

CHAPTER 4 – Customized GPT for Service Blueprint and Customer Journey Map

This chapter is the continuum of chapter 3 with the creation of another customized GPT to enhance service design activities by supporting the creation of two tools: the service blueprint and customer journey map. The creation process is described below with the test phase which aims to demonstrate LLMs contribute through a practical example of GPT application.

4.1 UX Builder

The GPT considered in this stage is a customized GPT to support the creation of service blueprints and/or customer journey maps in several steps that necessitate of human and AI interactions. Thanks to them a user experience is mapped, analysed and improved with additional elements that generate the desired outcome. This process comprehends the organizational system creation, typical of a service blueprint, and the emotional journey, typical of a customer journey map.

To make possible all the above-described goals, are necessary some instructions that determine the role and aims of the GPT.

But, before proceeding it is necessary to clarify the name of this GPT, that is “UX Builder”, and to establish the same rule used in chapter 3: prompts and instructions given to UX Builder are written inside a light grey box, while UX Builder responses are written inside a light blue box.

4.2 Instructions and Knowledge

The first step to do in GPT generation is to determine its role, its goals and the tone to use in user interactions. This information is provided to UX Builder through GPT Builder, a LLM provided by OpenAI that support any GPT creation. The following box represents the instructions generated:

This GPT acts as a service design expert consultant to support a multi-disciplinary team in the generation, improvement, and analysis of service blueprints and customer journey maps. It aims to provide expertise in streamlining services, identifying key journey map elements, offering blueprint feedback, and revealing pain points. In addition, it assists in creating service blueprints and customer journey maps from scratch, guiding users through the entire process. It also provides suggestions for improvements and solutions by analyzing user conversations and consulting documentation.

Once the instructions are generated, another choice is done regarding the selection of some files from literature to input inside of the GPT related to several topics: theoretical explanation of what is service blueprints and customer journey maps, and methodologies to create both the tools.

4.2 Test phase

The test phase in this chapter consists of a practical demonstration of how a GPT can support the creation of a service blueprint and customer journey map in a company. This is done in several steps, by designing customer actions,

blueprinting the process, improving with customer emotional journey and at the end final feedback of the outcome obtained. This test is presented in a step-by-step conversation between a user and UX Builder.

In the generation of the customer path and blueprinting the service there is a dualism, which regards the creation of two GPTs. The first GPT is the same described until now, so with the same instructions and knowledge mentioned. The second GPT is like the first one but with added specific knowledge about the same industry of the company considered: in particular documents with electrical maintenance regulations and intervention descriptions. Therefore, for a better understanding of the following paragraphs two names are decided for these new GPTs. The first GPT is called “UX Builder K” and the second one is called “UX Builder SK”.

The final component of the pre-liminary phase is related to the description of the company selected. It is the same of chapter 3, so: a company that offers a maintenance service for electrical systems in industrial and civil buildings and operates in a regional area identified as Padua, Italy. Moreover, it is assumed that this company wants to improve the customer experience of a certain customer segments because it has some unidentified issues.

4.3.1 Persona selection

For this experimentation it is necessary to select a persona for creating a service blueprint, as mentioned in chapter 1. Thanks to such persona’s perspective it is possible to delineate her action path.

For this reason, the following persona is randomly selected from Persona Builder SK because it has produced the best results.

Persona 1: The Proactive Residential Owner

- **Name:** Marco Bianchi
- **Age:** 45
- **Property:** Residential
- **Profile:** Marco is proactive about maintaining his home's electrical system to ensure safety and efficiency. He schedules regular check-ups and prefers services that offer thorough inspections and clear explanations.
- **Key Needs:** Reliability, high quality of work, and clear communication.
- **Preferred Communication:** Phone or app notifications.



4.3.2 Customer actions

The customer actions represent the path that the customer does along the service delivery. In this case we are supposing that Marco Bianchi wants a periodic ordinary maintenance which is regularly done 2 times per year.

In this case the temporal horizon is related to one intervention organization and execution, so it is in terms of weeks.

With such assumptions it is possible to create a prompt that will be used to generate the customer actions.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience of Marco Bianchi, the persona described in the attachment. Please, generate only his action path,

assuming the company wants to analyse the service experience of an intervention, which typically lasts two/three weeks.

4.3.2.1 UX Builder K

The response generated by UX Builder K is reported below:

Week 1: Initial Engagement

1. Identification of Need: Marco recognizes the necessity for a routine check-up of his home's electrical system.

2. Contacting Service Provider: He contacts the service provider through his preferred communication method—either phone or an app—to schedule the maintenance.

3. Appointment Confirmation: Marco receives an appointment confirmation detailing the date, time, and any preparations needed via the same communication method used for booking.

Week 2: Service Execution

4. Receiving Reminder: A day prior to the scheduled appointment, Marco gets a reminder notification ensuring he's prepared for the technician's visit.

5. Technician Arrival: The technician arrives at the scheduled time. Marco facilitates access to the electrical systems and discusses any specific concerns he might have.

6. Observation and Interaction: During the maintenance work, Marco actively engages with the technician, observing the process and asking questions to understand the health of his electrical systems.

7. Service Review: Post-service, the technician provides Marco with a summary of the maintenance performed, highlighting any issues found and actions taken.

Week 3: Follow-Up and Feedback

8. Receiving Report: Within a day post-service, Marco receives a detailed report via email or app notification, outlining the

maintenance performed and any recommendations for future care.

9. Feedback Submission: Marco completes a feedback survey through the service provider's app, sharing his satisfaction levels and any comments on the service quality.

10. Scheduling Next Service: If further interventions are suggested or necessary components need replacement, Marco schedules a follow-up service, utilizing the app or phone for convenience.

The response provided by the GPT is satisfactory in general terms because it presents all the elements that characterize customer actions in a service delivery, such as the chronological order of the elements and most of the physical and physiological aspects that involve the customer. Moreover, the customer actions represent a complete customer experience similar to reality because they are all plausible and there are no weird or uncommon elements. For this reason, this response can be considered acceptable in terms of content and level of analysis.

In this answer, there are elements that reflect the main characteristics of Marco Bianchi, demonstrating the coherence of the GPT, such as his curiosity during the intervention or the final report potentially requested by him.

4.3.2.2 UX Builder SK

The response generated by UX Builder SK is reported below:

1. Recognition of Need: Marco realizes the need for maintenance or repair in his electrical system, perhaps due to malfunctioning equipment or as part of regular maintenance.

2. Searching for Service Provider: He looks for a reliable service provider. This might involve online research, checking reviews, or asking for recommendations from friends or business associates.

3. Initial Contact: Marco contacts the service provider to discuss his needs. This could be through a phone call, email, or an online service request form.

4. Receiving Quote/Estimate: After discussing the specifics of the required service, Marco receives a detailed quote or estimate covering the costs and scope of the intervention.

5. Scheduling the Service: He agrees to the terms and schedules a date for the service to begin. This includes coordinating times when he is available to allow access to his property.

6. Service Preparation: Marco prepares for the service visit, which might include clearing the area around the electrical system or ensuring that necessary documentation about the system is available.

7. On-site Service Execution: The technician arrives and begins the maintenance or repair work. This stage may last for several days depending on the complexity of the job.

8. Progress Updates: Throughout the service period, Marco receives updates. This could be through direct communication from the technician or via a digital service platform.

9. Service Review and Feedback: At the end of the intervention, the technician reviews the completed work with Marco, explaining what was done and any follow-up actions or additional maintenance that may be needed in the future.

10. Closure of Service: Marco receives the final service report and invoice, completes payment, and the service provider confirms the end of the service period.

11. Post-Service Support: After the service, Marco has access to customer support for any subsequent questions or issues related to the service performed.

The response of the second GPT is similar to the previous one in terms of customer actions taken, but with small differences. In particular, the mention of payment here is important, as it can influence the customer's service experience. However, this is not the only difference; the presence of a quote adds higher

realism to the service delivery experience. All these elements contribute to a professional impact generated by the tool, even if a time reference is not made explicit.

Additionally, in this case, the GPT reflects the main characteristics of Marco Bianchi, similar to previous answers, such as the trigger and interactions with the technician during the maintenance service.

4.3.3 Blueprinting the process

Once the customer actions from the perspective of the Marco Bianchi persona are determined, the service blueprint can be built. To do this, it is necessary to identify all the actions taken by the organization in terms of frontstage, backstage, and eventually support processes.

This is possible by starting from the customer path outlined earlier, as for every action taken by the customer, there should be a corresponding action taken by the organisation.

This is possible to do with generative AI by providing it the customer actions along the service experience, and from which the model generates an output, that theoretically should be satisfactory.

For such task, the following prompt is given, including the customer action generated by the same GPT.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience of Marco Bianchi, the persona described in the attachment. For such persona is generated an action path, provided as an attachment. Based on it, blueprint the process,

including frontstage, backstage, and eventually support processes.

4.3.3.1 UX Builder K

The response is reported below:

Week 1: Initial Engagement

1. Customer Actions: Marco identifies the need for a routine check-up and contacts the service provider via phone or app.

2. Frontstage:

- Reception of Marco's request through chosen communication method.
- Customer service representative schedules the appointment and confirms it back to Marco using the same communication method.

3. Backstage:

- Scheduling system logs the appointment.
- Notification sent to the technician's schedule.

4. Support Processes:

- IT systems maintain and manage the scheduling and communication platforms.

Week 2: Service Execution

1. Customer Actions: Marco receives a reminder, greets the technician, and discusses any specific concerns.

2. Frontstage:

- Technician arrives at the scheduled time, greeted by Marco.
- Technician reviews the scope of work with Marco, answers questions, and conducts the maintenance.

3. Backstage:

- Preparation by the technician, including gathering necessary tools and reviewing Marco's electrical system's history.

4. Support Processes:

- Training for technicians on customer interaction and technical skills.
- Logistics manage the dispatch of technicians and equipment.

Week 3: Follow-Up and Feedback

1. Customer Actions: Marco receives a detailed report of the maintenance, completes a feedback survey, and schedules a follow-up service if necessary.

2. Frontstage:

- Delivery of the detailed report through email or app.
- Receipt and processing of Marco's feedback.

3. Backstage:

- Compilation of the maintenance report by the technician or support staff.
- Analysis of feedback for quality control.

4. Support Processes:

- Customer service software for tracking feedback and follow-up actions.
- Continuous training and quality assurance systems to improve service delivery based on feedback.

The GPT structures the answer by starting from the customer actions properly, listing all the frontstage, backstage and support processes associated with a block of activities. This approach allows for immediate recognition of the sequence in broad terms, but it is more difficult to determine the exact connection between individual customer actions and the organization. However, the activities performed by the organization are coherent with the customer actions and are plausible. There are no elements that are nonsensical or inappropriate; however, there is a missing element: when there is the “receiving reminder” occurs there are no corresponding organisational actions, which is implausible since such activity would pass through an IT system or involve an operator's operation.

4.3.3.2 UX Builder SK

The response is reported below:

1. Recognition of Need

- **Frontstage Actions:** None at this stage, as this is initiated by the customer.
- **Backstage Actions:** System monitoring and alerts that track service schedules and trigger maintenance reminders.
- **Support Processes:** Maintenance scheduling software that automatically sends notifications based on the last service date.

2. Searching for Service Provider

- **Frontstage Actions:** Online presence through the company website, customer reviews, and active responses on social media.
- **Backstage Actions:** SEO strategies and management of online reviews and feedback.
- **Support Processes:** Content management systems and digital marketing tools to enhance online visibility and engagement.

3. Initial Contact

- **Frontstage Actions:** Customer service interaction via phone, email, or online chat to gather details about Marco's needs.
- **Backstage Actions:** Logging of Marco's contact and the details of his requirements in the CRM system.
- **Support Processes:** CRM system for recording customer interactions and details.

4. Receiving Quote/Estimate

- **Frontstage Actions:** Delivery of a detailed quote or estimate through email or a personal meeting, explaining the scope and costs.
- **Backstage Actions:** Preparation of the quote based on the assessment of Marco's needs and the specifics of the electrical system.
- **Support Processes:** Pricing tools and cost estimation software to ensure accurate and fair pricing.

5. Scheduling the Service

- **Frontstage Actions:** Confirmation of service schedule through a phone call or email, providing Marco with date and time.
- **Backstage Actions:** Coordination with the technical team to schedule the visit according to Marco's availability and technician availability.

- **Support Processes:** Scheduling software that integrates with the CRM for efficient appointment setting.

6. Service Preparation

- **Frontstage Actions:** Instructions sent to Marco on how to prepare the area for the service visit.

- **Backstage Actions:** Preparation by staff to ensure all necessary tools and parts are ready for the job.

- **Support Processes:** Inventory management systems to check and prepare necessary equipment and materials.

7. On-site Service Execution

- **Frontstage Actions:** The technician performs the maintenance or repair work at Marco's site, interacting with him about the process.

- **Backstage Actions:** Supervisors monitor the progress and quality of work remotely.

- **Support Processes:** Mobile tools for technicians to access information on-site and report back to the office in real time.

8. Progress Updates

- **Frontstage Actions:** Regular updates provided to Marco via SMS, email, or a digital service platform.

- **Backstage Actions:** Monitoring and documenting the service progress in the company system.

- **Support Processes:** Integrated communication platforms that update both customer and service database simultaneously.

9. Service Review and Feedback

- **Frontstage Actions:** Final review with Marco, discussing the service performed and any further actions required.

- **Backstage Actions:** Documentation of the feedback and any issues raised during the review.

- **Support Processes:** Feedback tools integrated into the CRM for capturing customer satisfaction and service quality.

10. Closure of Service

- **Frontstage Actions:** Presentation of the final service report and invoice, and processing of Marco's payment.

- **Backstage Actions:** Final updates to the service records in the CRM.

- **Support Processes:** Billing software and payment processing systems.

11. Post-Service Support

- **Frontstage Actions:** Customer support available for Marco via phone, email, or online for any subsequent issues or questions.
- **Backstage Actions:** Ongoing monitoring of customer feedback and follow-up on any reported issues.
- **Support Processes:** Customer support ticketing system to manage inquiries and follow-ups efficiently.

In this case, the precision and comprehensibility are higher. Indeed, the GPT generates for each action all the blueprint components with a high level of detail. Sometimes, this level of detail is too much, including forcibly some elements that are too generic or too specific: for example, when in the support processes the GPT affirms that “Integrated communication platforms that update both customer and service database simultaneously.”, there is a technical exaggeration because this operation requires advanced tools. This is not wrong, but it takes for granted that the company possesses some specific tools, and this can bring to a bias.

However, the service blueprint can be considered complete and satisfactory.

4.3.4 Physical Evidence

Once the activities are determined, it is the moment to introduce the physical evidence. This is important because these are the elements that the customer sees and interacts with. Therefore, to determine them, the UX Builder must have the entire blueprint to understand which activities are performed and which interactions occur between the customer and the organization.

For this purpose, the following prompt is created.

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience of Marco Bianchi, the persona described

in the attachment. For such persona is generated the action path, the frontstage, backstage, and the support processes. This information is provided in the attachment. Generate all the physical evidence that are present in such blueprint.

4.3.4.1 UX Builder K

The answer is:

- 1. Service Vehicles:** Branded vehicles that are well-maintained and equipped, giving a professional first impression when arriving at Marco's residence.
- 2. Uniforms:** Neat, professional uniforms worn by the service technicians with visible company logos. This adds to the professionalism and helps in building trust.
- 3. Tools and Equipment:** High-quality, professional tools and equipment used during the maintenance work. This can reinforce the perception of high-quality service and reliability.
- 4. Invoices and Service Reports:** Clearly written and detailed invoices and service reports provided after each visit. These documents should outline what work was performed, any issues found, recommendations, and the pricing breakdown.
- 5. Identification Badges:** ID badges worn by all technicians. This helps in establishing legitimacy and security, allowing Marco to easily identify who is servicing his home.
- 6. Company Website and Mobile App:** These digital platforms can be used for scheduling services, viewing past service reports, and communicating with the company. They should be user-friendly and visually aligned with the company's branding.
- 7. Reminder and Notification System:** Emails, SMS, or app notifications that remind Marco of upcoming service appointments or follow-up actions. These should be well-designed and reflect the company's branding.

8. Safety Signage: Visible signage on tools and equipment regarding safety protocols and procedures during the service, enhancing the company's commitment to safety and efficiency.

9. Feedback Forms: Digital or physical feedback forms that Marco can fill out after the service is completed. This can help the company gauge satisfaction and areas for improvement.

10. Marketing Materials: Brochures or flyers that describe various services offered, highlighting benefits specifically important to proactive homeowners like Marco.

The physical evidence presented is pertinent to the context. There are some elements that are very important to consider in such situations, including vehicles, tools and equipment, uniforms and all other aspects that are evident to the customer. This is important because it demonstrates that the UX Builder is capable of identifying the crucial elements that require higher attention from the organisation.

4.3.4.2 UX Builder SK

1. Recognition of Need

- **Physical Evidence:** Notification alerts on phone or email indicating the need for maintenance based on predictive monitoring.

2. Searching for Service Provider

- **Physical Evidence:** Company website interface, social media profiles, online reviews, and search engine results.

3. Initial Contact

- **Physical Evidence:** Email confirmations, chat logs, or call history that document the initial inquiry.

4. Receiving Quote/Estimate

- **Physical Evidence:** Written or digital quotes sent via email or handed over during a personal meeting, detailing costs and scope.

5. Scheduling the Service

- **Physical Evidence:** Appointment confirmation emails or SMS, calendar entries.

6. Service Preparation

- **Physical Evidence:** Pre-service instructions sent to Marco on how to prepare the service area, which might include emails or printed guides.

7. On-site Service Execution

- **Physical Evidence:** Job sheets or work orders used by the technician onsite, visible ID badges or uniforms worn by technicians.

8. Progress Updates

- **Physical Evidence:** SMS, emails, or updates through a digital service platform showing the progress of the work.

9. Service Review and Feedback

- **Physical Evidence:** Service completion forms, feedback forms either digital or on paper.

10. Closure of Service

- **Physical Evidence:** Final service report, printed or digital invoices, payment receipts.

11. Post-Service Support

- **Physical Evidence:** Emails, support tickets, chat transcripts or records of phone calls for any follow-up support.

The differences in the physical evidence generated by UX Builder SK are minimal related with UX Builder SK. Therefore, the results are as good as those from the previous GPT, without any issues.

4.3.5 Emotional journey

The service blueprint requires of the final elements to be completed. These are the connections or links between the actions, processes, and other elements of

the tool, to outline their relationship. This task is performed for both GPTs by the user, who makes connections based on the information provided in paragraphs 4.3.3.1 and 4.3.3.2, respectively depicted in Figure 4.1 and 4.2, which are a visual representation of the results.

Now, the emotional journey of the Marco Bianchi persona can be integrated. Firstly, a rule is established to represent and rate his satisfaction level of him. Indeed, the evaluation ranges from -3 to +3, where +3 indicates a highly positive experience, -3 indicates a highly negative experience, and 0 is neutral.

Based on that, the GPTs are asked to provide a rating of the service experience from Marco Bianchi's perspective, assuming that there are some issues with such experience. This decision is based on the initial assumption cited in paragraph 4.3.

So, this is the prompt used:

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience of Marco Bianchi, the persona described in the attached document, because the service provided has some issues. A service blueprint for this persona is also provided in the attachment. Rate the satisfactory level of Marco Bianchi's experience for each action in the service delivery process, from -3 to +3, where +3 indicates a highly positive experience, -3 indicates a highly negative experience, and 0 is neutral.

4.3.5.1 UX Builder K

Week 1: Initial Engagement

1. Identification of Need: +2. Marco is proactive and recognizes the need for maintenance, which meets his expectations but doesn't exceed them.

2. Contacting Service Provider: +1. While using his preferred communication method is positive, any delays or inefficiencies in response could lower satisfaction.

3. Appointment Confirmation: +1. Confirmation provides essential details but could be improved with more personalized or additional relevant information.

Week 2: Service Execution

4. Receiving Reminder: +2. This reminder helps Marco prepare, fitting well with his organized nature and expectation for proactive service.

5. Technician Arrival: 0. The technician arrives on time, but if the technician does not match Marco's expectations for professionalism or preparedness, this could neutralize the positive impact.

6. Observation and Interaction: -1. If the technician fails to thoroughly answer Marco's questions or the interaction lacks the depth of information Marco seeks, this would result in a negative experience.

7. Service Review: -2. If the review is cursory and lacks detailed explanation or fails to identify potential future issues effectively, it would lead to a significantly negative impression, given Marco's emphasis on thoroughness.

Week 3: Follow-Up and Feedback

8. Receiving Report: +1. Although receiving the report aligns with Marco's need for detailed documentation, any lack of clarity, delayed delivery, or omission of critical information could diminish satisfaction.

9. Feedback Submission: 0. Marco has the opportunity to voice his satisfaction or concerns, but this action alone does not enhance his experience unless the feedback is acknowledged and acted upon.

10. Scheduling Next Service: +1. The ease of scheduling a follow-up service meets expectations but does not exceed what Marco would consider basic service quality.

The evaluation of the GPT in relation to the emotional path of Marco Bianchi throughout the service experience is surprisingly sensible, given that these are, of course, hypothetical evaluations not based on real facts, due to the lack of input data. However, the GPT is able to analyse the potential implications of

incorrect task execution. This is very useful, because it helps the user understand where the crucial moments where an error could lead to a negative experience for the persona. For example, the service review is very important according to Marco Bianchi's behaviour, so poor execution could result in a very negative experience. Conversely, tasks like feedback submission have no impact on Marco Bianchi even if poorly managed. This suggests a need for more focus on specific parts of the process.

The emotional path generated by UX Builder K is represented in Figure 4.1 with a chart to help the user for a faster visual interpretation of the crucial moments.

PHYSICAL EVIDENCE	Marketing Materials	Company Website and Mobile App + Reminder and Notification System	Company Website and Mobile App + Reminder and Notification System	Company Website and Mobile App + Reminder and Notification System
	↓	↔	↔	↓
CUSTOMER ACTIONS	Identification of Need: Marco recognizes the necessity for a routine check-up of his home's electrical system.	Contacting Service Provider: He contacts the service provider through his preferred communication method—either phone or an app—to schedule the maintenance.	Appointment Confirmation: Marco receives an appointment confirmation detailing the date, time, and any preparations needed via the same communication method used for booking.	Receiving Reminder: A day prior to the scheduled appointment, Marco gets a reminder notification ensuring he's prepared for the technician's visit.
LINE OF INTERACTION	----- ↓ ----- ↔ ----- ↓ -----			
FRONTSTAGE ACTIONS	Reception of Marco's request through chosen communication method.		Customer representative schedules the appointment and confirms it back to Marco using the same communication method.	
LINE OF VISIBILITY	----- ↓ -----			
BACKSTAGE ACTIONS	Scheduling system logs the appointment.		Notification sent to the technician's schedule.	
LINE OF INTERNAL INTERACTION	----- ↔ -----			
SUPPORT PROCESSES	IT systems maintain and manage the scheduling and communication platforms.			
	3			
	1			
	-1			
	-3			

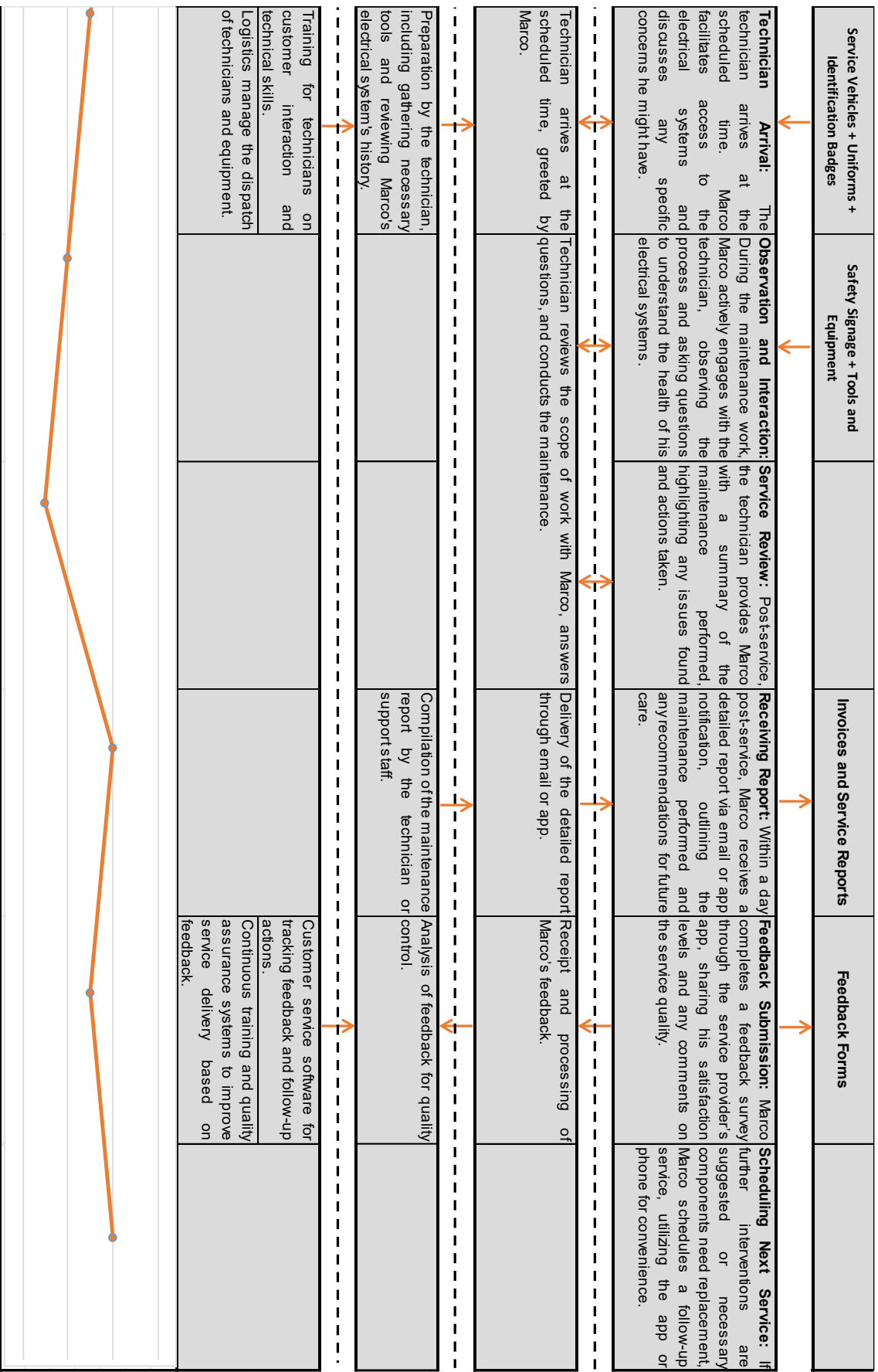


Figure 4.1: visual representation of the service blueprint with the emotional journey generated by UX Builder K.

4.3.5.2 UX Builder SK

- 1. Recognition of Need:**
 - **Satisfaction Level: +1**
 - Marco recognizes the need for maintenance, indicating a slight positive response due to proactive behavior but neutral since it stems from necessity.
- 2. Searching for Service Provider:**
 - **Satisfaction Level: +1**
 - Marco seeks a reliable service provider, showing a positive inclination towards finding quality service, but it involves effort which makes it not overly positive.
- 3. Initial Contact:**
 - **Satisfaction Level: +2**
 - Initial contact with the service provider is likely efficient and welcoming, given Marco's preference for clear communication, contributing to a higher satisfaction.
- 4. Receiving Quote/Estimate:**
 - **Satisfaction Level: 0**
 - Marco receives a detailed quote which he expects as part of good service, making this a neutral experience as it meets but does not exceed expectations.
- 5. Scheduling the Service:**
 - **Satisfaction Level: +1**
 - Coordinating schedules shows a level of organization but might include minor inconveniences, hence a slightly positive score.
- 6. Service Preparation:**
 - **Satisfaction Level: 0**
 - Marco prepares for the visit, which is more of a neutral experience since it requires personal effort without direct interaction with the service provider.
- 7. On-site Service Execution:**

- **Satisfaction Level: -1**
 - The execution may involve disruptions or delays common in maintenance work, leading to a slightly negative experience.
- 8. Progress Updates:**
 - **Satisfaction Level: +2**
 - Receiving updates likely provides reassurance and transparency, aligning with Marco's need for clear communication, thus enhancing satisfaction.
- 9. Service Review and Feedback:**
 - **Satisfaction Level: +2**
 - Reviewing the service directly with the technician offers an opportunity for immediate clarifications and feedback, likely a positive experience.
- 10. Closure of Service:**
 - **Satisfaction Level: +1**
 - Finalizing the service with payment and confirmation is typically procedural but handled efficiently, yielding slight positive feelings.
- 11. Post-Service Support:**
 - **Satisfaction Level: +3**
 - Access to customer support for follow-up questions significantly enhances Marco's experience, especially if his concerns are addressed promptly and effectively.

In this case, the emotional journey is less useful and biased due to the lack of real input data. The emotional journey would likely be more accurate if the GPT were fed with real reviews or feedback about similar delivered services. This approach would better reflect the user's actual feelings about their experience.

In short, this evaluation may not be useful for a preliminary analysis of a specific process, but it could be very powerful and effective for improving an existing process using real data.

The emotional path generated by UX Builder SK is represented in Figure 4.2 with a chart to help the user for a faster visual interpretation of the crucial moments.

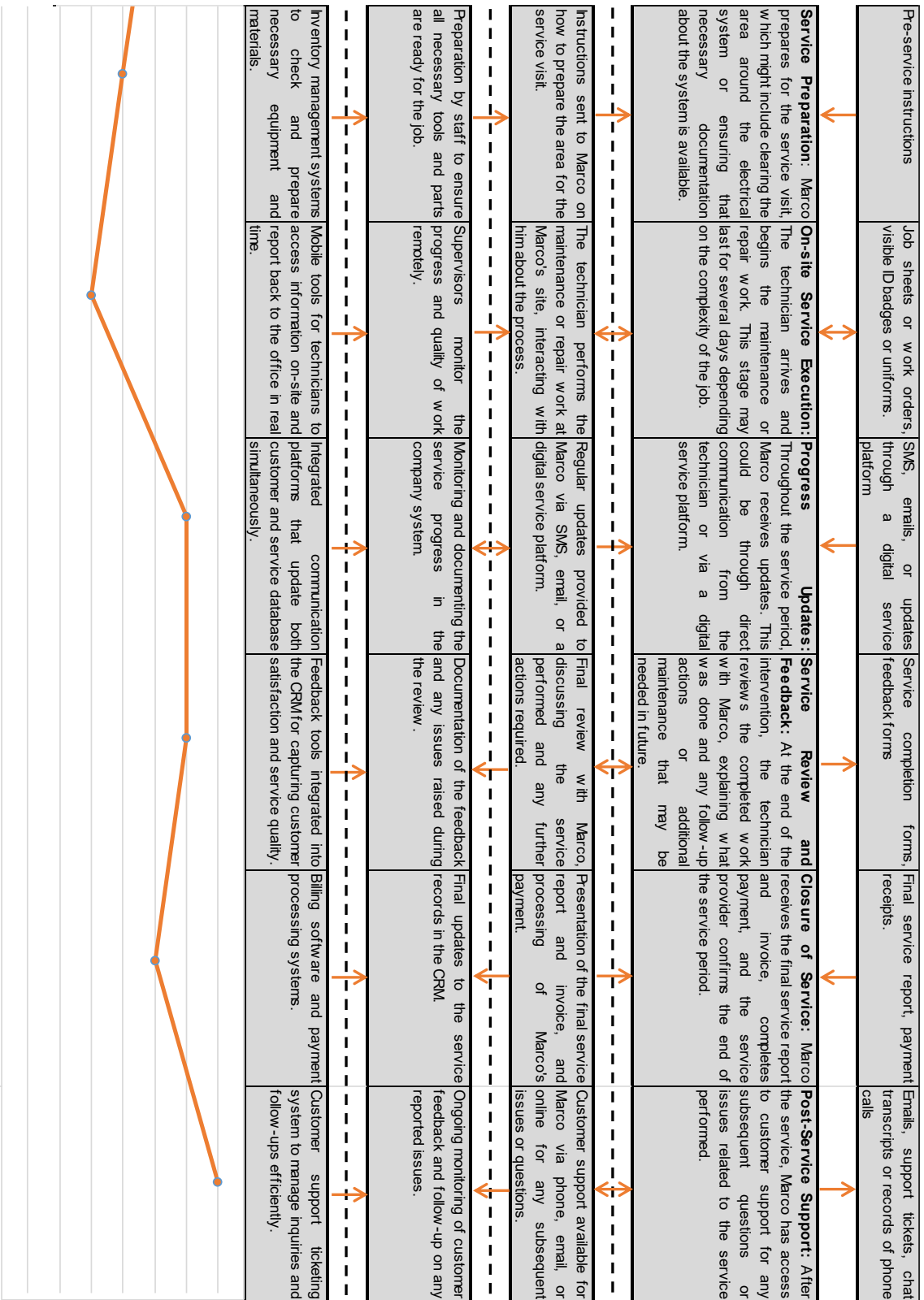


Figure 4.2: visual representation of the service blueprint with the emotional journey generated by UX Builder SK.

4.3.6 Improvements

After generating the outcome, the final step involves asking the UX Builder for suggestions to improve the company's service experience and offering some concrete solutions.

The prompt given is:

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience of Marco Bianchi, the persona described in the attachment. For such persona is generated a service blueprint, incorporating his feedback about his experience. Provide some suggestions to improve Marco Bianchi's service experience, proposing concrete solutions to implement, especially for those points with a low rate.

4.3.6.1 UX Builder K

Week 1: Initial Engagement

- **Contacting Service Provider:** Implement an automated confirmation system that instantly acknowledges receipt of Marco's request, followed by a timely, personalized response. Consider using CRM software that allows for immediate customer acknowledgment and queueing system notifications to staff for quick follow-up.
- **Appointment Confirmation:** Customize the confirmation process by incorporating details about the technician who will be handling the service, including a brief profile or photo. Also,

include a checklist of what Marco can expect during the visit to better prepare him and personalize the communication further.

Week 2: Service Execution

- **Technician Arrival:** Improve training programs for technicians to ensure they meet high standards of professionalism and preparedness. Implement a pre-visit checklist that technicians must complete, confirming they are fully prepared and have reviewed Marco's service history and specific needs before arrival.

- **Observation and Interaction:** Enhance the depth of technician training to include not only technical skills but also communication skills, focusing on how to explain technical details to clients in a comprehensible way. Introduce a protocol where technicians must provide clients with a detailed walkthrough of the work being performed, using visual aids or apps to display system health and maintenance actions.

- **Service Review:** Develop a standardized but customizable template that technicians can use to provide detailed reviews post-service. This template should include sections for explaining the condition of the system, any immediate concerns, and future recommendations. Training should also emphasize the importance of thorough explanations and the potential future needs of the system.

Week 3: Follow-Up and Feedback

- **Receiving Report:** Ensure the reports are not only detailed but also timely. Implement a quality check process that ensures reports are comprehensive and sent out within a specific time frame post-service. Consider using automated systems that generate reports directly from the technicians' inputs during the service.

- **Feedback Submission:** Actively use the feedback received by initiating changes or improvements discussed in feedback sessions. Communicate back to Marco what changes have been made as a result of his suggestions, enhancing his trust and satisfaction with the service.

- **Scheduling Next Service:** Introduce a predictive service scheduling tool that uses the history of Marco's service data to suggest future service dates and potential issues that may arise. This tool should allow Marco to easily accept or modify the proposed schedule.

Additional Enhancements

- **Digital Integration:** Develop a more robust app that can serve as a central hub for Marco to manage his services, view detailed

reports, receive maintenance reminders, schedule services, and provide feedback.

- **Loyalty Incentives:** Introduce a loyalty program that rewards customers for regular maintenance and feedback provision, perhaps offering discounts or additional services based on the customer's engagement level.

The suggestions proposed by UX Builder K are valuable and, mostly important, feasible. They can effectively improve the service delivery process in many aspects, but what it is evident that the focus of any improvements is customer satisfaction. This is important because generative AI understands that these tools are designed to firstly enhance the customer experience.

4.3.6.2 UX Builder SK

1. Streamline Communication and Response Times

Marco's feedback indicates dissatisfaction with slow response times. Implement a more robust CRM system to ensure quicker, more personalized responses. Automation can help manage routine inquiries, while complex issues can be escalated to specialists.

2. Improve Transparency and Information Availability

Marco experiences uncertainty regarding the status of his service requests. Introduce a customer portal where he can track the status of his maintenance requests, view scheduled appointments, and access service history. This transparency builds trust and reduces frustration.

3. Enhance On-Site Service Experience

Feedback points to some dissatisfaction with on-site interactions. Provide additional training for technicians to improve their customer interaction skills and ensure they fully explain the process and any changes made during the visit. Consider implementing a standard checklist that technicians can follow to ensure consistency.

4. Optimize Scheduling and Flexibility

Difficulties in scheduling convenient service times have been noted. Develop a more flexible scheduling system that allows customers to select preferred time slots directly through an app or website. This system should also send reminders and allow for easy rescheduling.

5. Post-Service Follow-Up

Post-service follow-up is crucial for customer satisfaction and capturing ongoing feedback. Implement a systematic follow-up process via email or SMS that asks for feedback and offers assistance if there are further issues. This not only shows care but also helps in quickly resolving any unresolved issues.

6. Customized Service Packages

Marco's feedback highlights a need for services that are more tailored to his specific needs. Offer customizable service packages where customers can choose from a range of options that best suit their requirements and budget.

7. Loyalty Programs and Incentives

To encourage repeat business and enhance satisfaction, introduce loyalty programs that offer discounts or other benefits to regular customers. This could include priority scheduling, discounts on certain services, or annual check-ups at reduced rates.

8. Use of Technology for Efficiency

Leverage technology to improve operational efficiency—this could involve using IoT for predictive maintenance or mobile apps for real-time communication between field staff and the central office.

In this case, the answer is even more focused on Marco Bianchi, because UX Builder SK is focused on the weak points of the service delivery process. This allows for the determination of solutions aimed at improving such aspects of customer dissatisfaction. The proposed solutions to enhance this process are, as before, valuable and easy to implement.

4.3 Observations

The UX Builder is a valuable GPT that offers many opportunities, which in this chapter were limited to the generation of a tool that combines the service blueprint and the customer journey map. Interactions with users show that using such LLMs is very easy, but this does not mean the result will be banal or simplified, as the complexity and concreteness are evident.

Regarding the dualism of UX Builder, the differences are not highly marked, but there are some aspects more appreciated by UX Builder SK than UX Builder K. These aspects relate to a higher tracking of customer experience events, such as quotes and payments, which are not irrelevant elements. These are captured by UX Builder SK, while UX Builder K does not.

However, the results can be improved beyond what is presented in this chapter by using detailed documentation of customer experiences, which is missing in this case. This is a general rule for any GPT, as seen in chapter 3, because GPTs tend to generate creatively based on a solid foundation.

4.4 A real case

After the test phase, which was useful to establish the potential ability of LLMs to generate from zero a service blueprint and a customer journey map, now there is an attempt to assess the capabilities of the previous GPTs to simply and enhance a real service delivery process.

Indeed, in this stage, a real service blueprint that represents a typical periodical maintenance service of a real company (the company is the same as in the previous cases) will be presented. In this case, it is asked to the GPTs to evaluate the actual process and to improve it.

In this simulation, the intervention of the Persona Builder model is also necessary to generate a persona and to simulate a typical interview with the company's customer in relation to the service blueprint. This is done to generate feedback

about the process, that is used for building the customer emotional journey and to outline pain points and opportunities for enhancements.

4.4.1 The real service blueprint





The real service delivery process proposed is represented by Figure 4.3, and it represents the typical scheduling and execution of an ordinary maintenance for an already acquired customer. In this specific case, the maintenance is semestral, and it is analysed only at a specific moment: from the scheduling of one intervention to the billing.

It does not specify the content of the intervention to keep it valuable for any kind of such ordinary maintenance services. But it is given a timeline to report the typical execution time for specific tasks. Obviously, they are approximations of reality, because it is nearly impossible to determine a precise lead time. However, the main aspects reflect the reality in terms of time and activities to do.

In this service blueprint, there are some phases that are deliberately more complex, because it is decided to analyse a process that contains most of the typical issues of the company's service. This is to evaluate the GPT's ability to identify such issue and to propose valuable solutions.

The service blueprint is reported below:

DAY 1: PRE-SERVICE				
TIMELINE	1 min	10 min	2 min	30 min
PHYSICAL EVIDENCE			Communication method.	
CUSTOMER ACTIONS			The customer doesn't respond.	
LINE OF INTERACTION	-----			
FRONTSTAGE ACTIONS			The technical office calls the customer.	
LINE OF VISIBILITY	-----			
BACKSTAGE ACTIONS	The technical office receives the reminder that the semestral routine maintenance for the customer must be performed.	The technical office verifies the type of intervention to be performed and its geographical location, also determining its duration. An estimation of the price is predetermined.		
LINE OF INTERNAL INTERACTION	-----			
SUPPORT PROCESSES	The management software sends the notification to the technical office for the scheduling of the technical intervention.	Google maps, price list.		
NOTES			Most of the time, the customer doesn't respond the first time.	

DAY 1: PRE-SERVICE		DAY 10: PRE-SERVICE		DAY 11: SERVICE DELIVERY	
15 min	10 min	15 min	2 min		
Communication method.			Communication method.		
The customer responds and requests information regarding the cost and duration of the intervention and communicates their availability to perform the intervention.			The customer responds and confirms their presence.		
<p style="text-align: center;"></p>			<p style="text-align: center;"></p>		
The technical office calls again the customer to arrange the scheduling of the intervention and communicates the cost estimation of the intervention, its duration, and what will be done.			The technician drives five minutes before his arrival, he calls the customer to inform them of his arrival.		
-----		-----		-----	
	The technical office schedules the intervention, according to the previous call, in the software that the technician will perform on the predetermined date and time, entering the customer's data, and the activity to be carried out.		The technician checks the scheduled interventions for the following day on their personal tablet and prepares the necessary equipment.		
<p style="text-align: center;"></p>		<p style="text-align: center;"></p>			
	Management software.		Management software, tablet, warehouse.		
The second time the customer typically responds. It is very rare that the customer doesn't respond after two attempts.					The customer almost always responds to the call because they are informed of a duty.

DAY 11: SERVICE DELIVERY

15 min	15 min	120 min	10 min
Vehicle, clothing.	Equipment, safety system.	Order and cleanliness.	

The customer welcomes the technician and leads them to the location where the intervention will take place.			
---	--	--	--



The technician arrives at the customer's location.	The technician brings the equipment to the designed location and proceeds with the intervention after securing the area.	The technician completes the intervention.	The technician fills out a digital technical intervention report on the tablet to sum up his activity and extra costs due to the usage of components not included in the original price.
--	--	--	--

--	--	--	--

		Tablet.	

DAY 11: SERVICE DELIVERY


1 min	2 min	1 min	1 min
Communication method.	Communication method, intervention report, tablet.	Communication method.	Intervention report.

The customer is informed of the conclusion of the intervention.	The customer sees the intervention details, including the predetermined price and extra costs and signs it.	The customer provides the e-mail address.	The customer receives a signed copy of the intervention report by e-mail.
---	---	---	---

The technician informs the customer by phone that the intervention is completed.	The technician shows them the intervention report on the tablet for signature and approval.	The technician asks the customer for an e-mail address to send the technical report to the customer.	He then sends a signed copy to the customer and the technical office by e-mail.
--	---	--	---

			The technical office receives a signed copy of the intervention report and schedules the next semestral maintenance in the management software.
--	--	--	---

bluet.		Tablet.	Management software, tablet, e-mail.
	Almost always, the customer signs the report in front of extras, because they are well justified by the technician.		

DAY 11: SERVICE DELIVERY			DAY 15: POST-SERVICE	
2 min	15 min	2 min		5 min
Communication method.	Payment receipt.			
The customer pays.	The customer receives a receipt for the payment.			
				
The technician asks the customer for the payment method and receives the payment.	The technician gives the customer their payment receipt, and the company copy is marked with the customer's name. After that, the technician collects his staff and goes away.			

		The technician delivers in a specific box the payment receipt.		The technical office collects the payment receipts and combine them with the printed digital intervention report.

POS.		Physical box.		
Most of the time, the payment is made via POS, but occasionally it can happen in cash.				

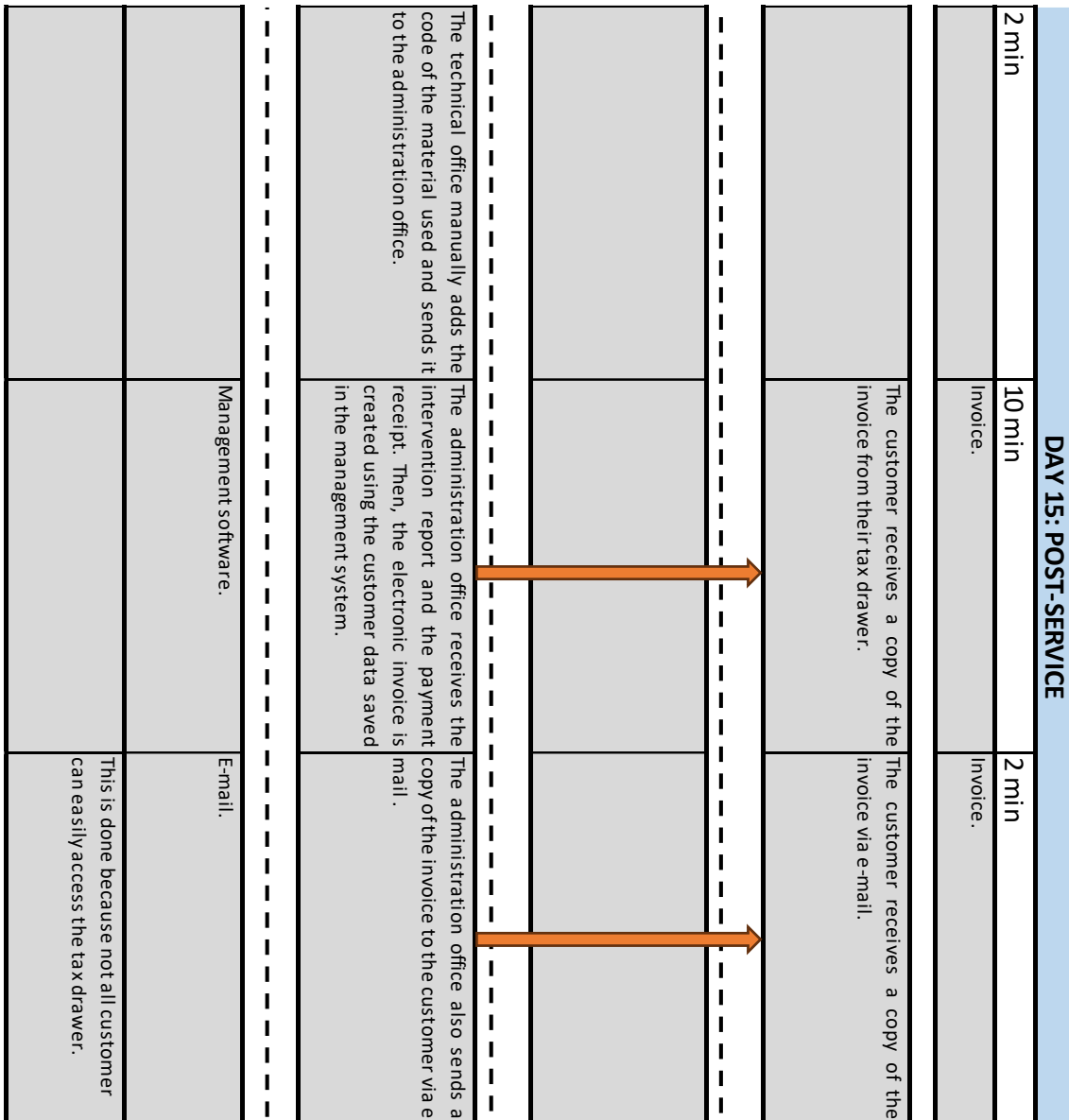


Figure 4.3: visual representation of the service blueprint of a real service.

4.4.2 Persona feedback

As stated before, to develop the emotional journey of the customer using the service blueprint, it is necessary to create a persona and formulate questions for their interview. To create a persona, it is necessary to determine a persona and questions to use in their interview.

To create a persona, the Persona Builder SK is used by prompting the following text:

You are working for a company that offers maintenance services for electrical systems in residential and industrial buildings mainly located in Padua, Italy, and is looking to enhance the customer experience. Please, generate a persona that includes the following elements:

- They are an existing customer
- They schedule periodic maintenance
- They maintain their own home

Generate the other elements based on your knowledge.

Persona: Giovanni Bianchi

Demographic Information

- Name: Giovanni Bianchi
- Age: 50
- Location: Padua, Italy
- Occupation: IT Manager
- Family Status: Married with one teenage son



Background

Giovanni is a tech-savvy IT Manager who values efficiency and preventive maintenance. He owns a modern home in Padua and ensures its electrical systems are well-maintained.

Goals

- Maintain home electrical safety and efficiency.
- Prevent electrical failures and disruptions.
- Integrate maintenance into a busy schedule.

Challenges

- Coordinating appointments with work.
- Ensuring thorough maintenance.

- Staying updated on electrical safety standards.

Needs

- Reliable, timely maintenance services.
- Clear, actionable maintenance reports.
- Flexible scheduling and reminders.

Behaviors

- Schedules bi-annual maintenance.
- Reviews service reports in detail.
- Uses technology to manage schedules.

Pain Points

- Scheduling conflicts.
- Inconsistent service quality.
- Hidden issues in electrical systems.

Preferences

- Digital communication and online scheduling.
- Detailed documentation and transparency.
- Modern tools and techniques.

Technology Usage

- Extensive use of smartphone and laptop.
- Prefers online booking and digital records.
- Reads reviews and compares services online.

Quote

"I need thorough, efficient maintenance services that fit seamlessly into my schedule and keep my home safe."

Service Expectations

- Punctual and professional technicians.
- Detailed, understandable reports.
- Proactive communication and flexible scheduling.

Once the persona has been created, it is time to generate questions for simulating Giovanni Bianchi's interview about the typical service delivery process depicted in Figure 4.3.

To do that, the following prompt is provided to the Persona Builder SK:

You are working for a company that offers maintenance services for electrical systems that is looking to enhance the customer experience of its service delivery process, represented by the service blueprint. Generate questions for each customer action to interview the provided persona and collect information about his satisfaction with the service. From these questions, it should be possible to build an emotional journey of the customer. So, it is important to collect information only on customer actions stages.

Day 1: Pre-Service

1. Customer doesn't respond to the initial call:
 - "Giovanni, how did you feel when you noticed the missed call from the maintenance service?"
 - "What were your immediate thoughts or concerns upon seeing the missed call?"
2. Customer responds and requests information:
 - "How did you feel when you received the follow-up call from our technical office?"
 - "Was the information regarding the cost and duration of the intervention clear and satisfactory?"
 - "Did you find it easy to communicate your availability for the maintenance appointment?"

Day 11: Service Delivery

3. Customer confirms their presence:
 - "How did you feel when you received the confirmation call from the technician about their arrival?"
 - "Was the timing of the call convenient for you?"
4. Customer welcomes the technician:

- "How did you feel about welcoming the technician into your home?"

- "Was the technician's arrival on time, and did they appear professional?"

5. Customer sees the technician securing the area and starting the intervention:

- "How did you feel watching the technician secure the area and begin the maintenance work?"

- "Did the technician explain the steps they were taking to ensure safety and thoroughness?"

6. Customer informed of the intervention completion:

- "How did you feel when you were informed that the maintenance was completed?"

- "Was the communication about the intervention's completion clear and satisfactory?"

7. Customer reviews and signs the intervention report:

- "How did you feel reviewing the intervention report on the technician's tablet?"

- "Were all the details, including any extra costs, explained to your satisfaction?"

8. Customer provides an e-mail address for the report:

- "How did you feel about providing your e-mail address for receiving the intervention report?"

- "Is receiving the report via e-mail your preferred method of communication?"

9. Customer receives the intervention report via e-mail:

- "How did you feel when you received the signed intervention report in your e-mail?"

- "Was the report easy to understand and did it contain all the necessary details?"

10. Customer makes the payment:

- "How did you feel about the payment process for the maintenance service?"

- "Was the payment method convenient and efficient for you?"

11. Customer receives the payment receipt:

- "How did you feel when you received your payment receipt?"

- "Was there anything about the payment process or receipt that could be improved?"

Day 15: Post-Service

12. Customer receives a copy of the invoice:
 - "How did you feel when you received the invoice in your tax drawer?"
 - "Was the invoice clear and accurate? Did it match your expectations?"

13. Customer receives a copy of the invoice via e-mail:
 - "How did you feel about receiving the invoice via e-mail as well?"
 - "Is receiving the invoice through multiple channels beneficial for you?"

With these questions, it is time to stimulate an interview with Giovanni Bianchi regarding the service blueprint created. To do this, GPT-4 is used instead of Persona Builder SK to minimize potential biases as much as possible.

The prompt given to GPT-4 is provided below:

You represent Giovanni Bianchi, a customer of a company that offers maintenance services for electrical systems, as depicted by the provided persona. Simulate an interview using the following questions to answer in relation to the provided service blueprint. From this interview, all potential issues that create a bad impression on Giovanni should emerge.

...here are reported the questions...

The interview is included in the attachment.

Now, using the interview, it is possible to map the emotional journey of the customer along the service delivery process. This can be done as in previous cases, by using the UX Builder. In this situation, it has been decided to use UX Builder SK to ensure that the GPTs used in this scenario are trained with specific knowledge.

To perform this task, the following prompt is generated:

You are working for a company that offers maintenance services for electrical systems and is looking to enhance the customer experience for Giovanni Bianchi during the service delivery process, as outlined in the service blueprint.

Based on Giovanni Bianchi's interview, rate the satisfactory level of Giovanni Bianchi's experience for each customer action in the service delivery process, from -3 to +3, where +3 indicates a highly positive experience, -3 indicates a highly negative experience, and 0 is neutral.

This will create the emotional journey of the customer journey map.

Day 1: Pre-Service

1. Customer doesn't respond to the initial call
 - Rating: -2
 - Reason: Giovanni felt frustrated and anxious about missing the call and rescheduling.
2. Customer responds and requests information
 - Rating: +1
 - Reason: Giovanni felt relieved that the office followed up quickly, although he was concerned about the high cost.

Day 11: Service Delivery

3. Customer confirms their presence
 - Rating: +2
 - Reason: Giovanni appreciated the timely confirmation call which reassured him.
4. Customer welcomes the technician
 - Rating: +1
 - Reason: Initially apprehensive about having a new person in his home, but felt better once the technician arrived on time and appeared professional.
5. Customer sees the technician securing the area and starting the intervention
 - Rating: +3

- Reason: Giovanni felt confident and reassured by the technician's clear explanation and focus on safety.

6. Customer informed of the intervention completion

- Rating: +2

- Reason: Giovanni was glad and relieved that the work was done on time and communicated clearly.

7. Customer reviews and signs the intervention report

- Rating: +1

- Reason: Giovanni found reviewing the report on the tablet fine, but preferred paper formats.

8. Customer provides an e-mail address for the report

- Rating: 0

- Reason: Giovanni was comfortable providing his e-mail but was concerned about potential spam and preferred having a physical copy as well.

9. Customer receives the intervention report via e-mail

- Rating: +3

- Reason: Giovanni appreciated receiving a clear and detailed report promptly.

10. Customer makes the payment

- Rating: 0

- Reason: The payment process was smooth and convenient, but Giovanni felt the service was expensive.

11. Customer receives the payment receipt

- Rating: +2

- Reason: Giovanni felt reassured having the receipt for his records.

Day 15: Post-Service

12. Customer receives a copy of the invoice in the tax drawer

- Rating: +1

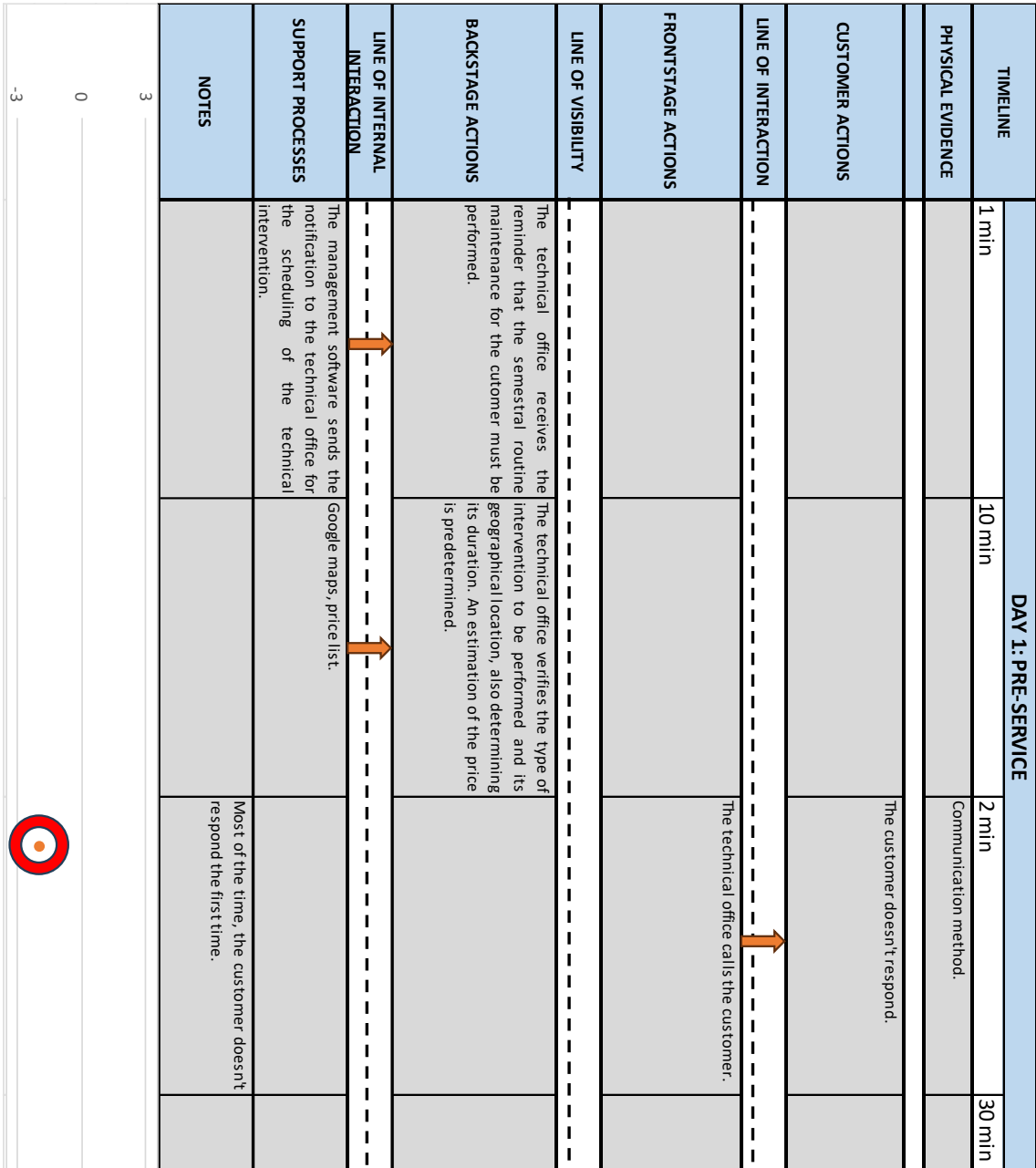
- Reason: It was convenient, though Giovanni needed some help accessing it.



13. Customer receives a copy of the invoice via e-mail



- Rating: +2

- Reason: Receiving the invoice through multiple channels ensured he didn't miss it, though he found it slightly redundant.

Once the ratings are obtained, they can be visually represented in the service blueprint as the customer emotional journey, as showed by Figure 4.4.



DAY 1: PRE-SERVICE		DAY 10: PRE-SERVICE		DAY 11: SERVICE DELIVERY	
15 min	10 min	15 min		2 min	
Communication method.				Communication method.	
The customer responds and requests information regarding the cost and duration of the intervention and communicates their availability to perform the intervention.				The customer responds and confirms their presence.	
					
The technical office calls again the customer to arrange the scheduling of the intervention and communicates the cost estimation of the intervention, its duration, and what will be done.				The technician drives five minutes before his arrival, he calls the customer to inform them of his arrival.	

	The technical office schedules the intervention, according to the previous call, in the software that the technician will perform on the predetermined date and time, entering the customer's data, and the activity to be carried out.	The technician checks the scheduled interventions for the following day on their personal tablet and prepares the necessary equipment.			
					
	Management software.	Management software, tablet, warehouse.			
The second time the customer typically responds. It is very rare that the customer doesn't respond after two attempts.				The customer almost always responds to the call because they are informed of a duty.	

DAY 11: SERVICE DELIVERY

15 min	15 min	120 min	10 min
	Equipment, safety system.	Order and cleanliness.	

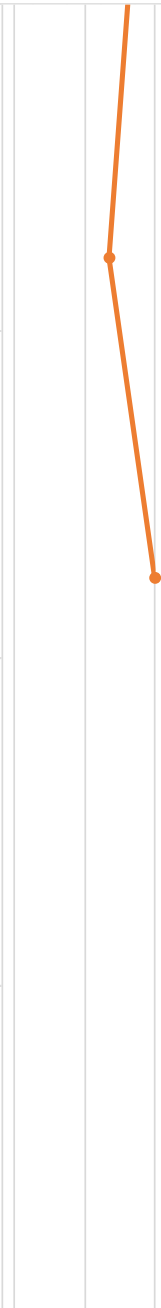
The customer welcomes the technician and leads them to the location where the intervention will take place.			
---	--	--	--



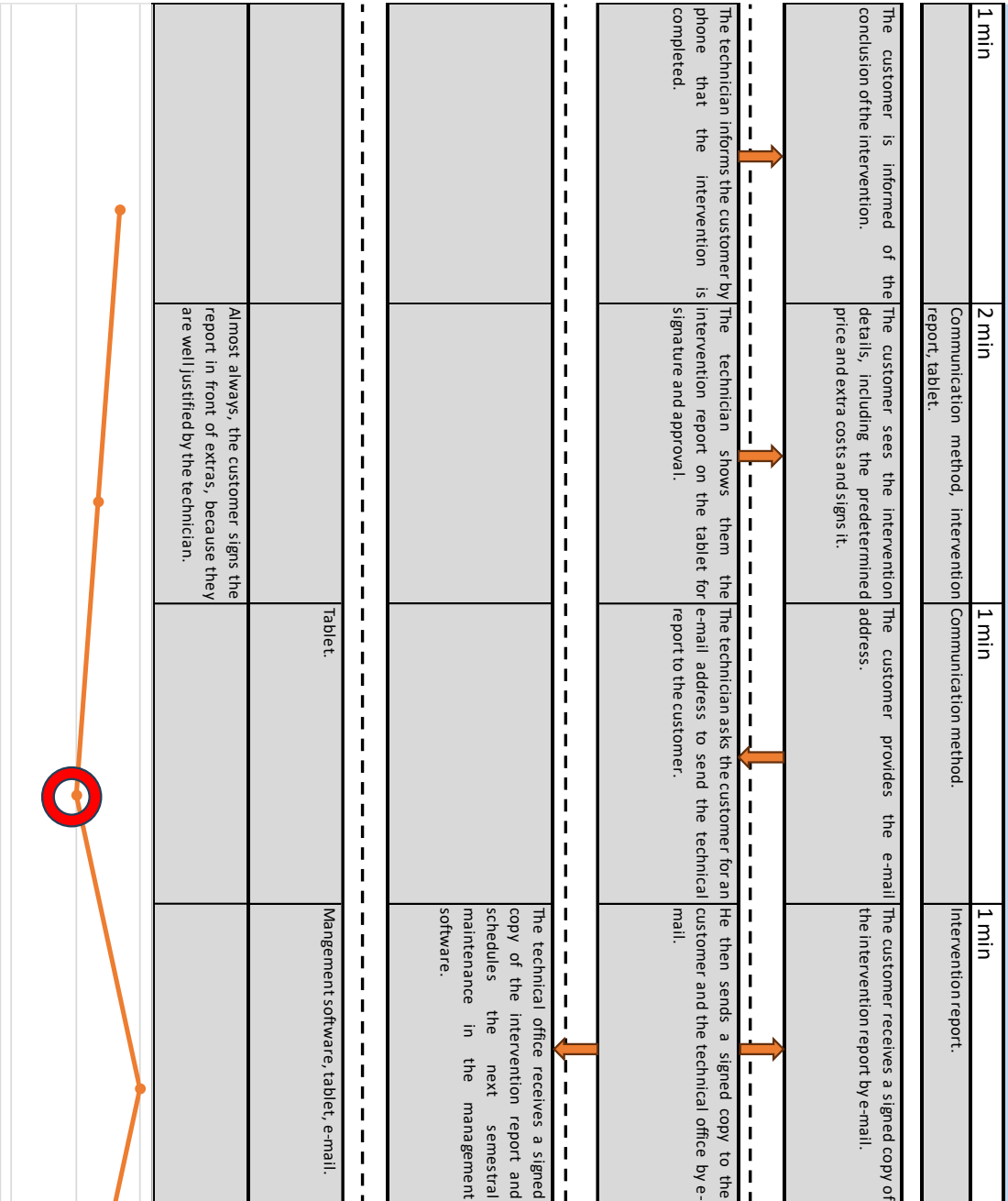
The technician arrives at the customer's location.	The technician brings the equipment to the designed location and proceeds with the intervention after securing the area.	The technician completes the intervention.	The technician fills out a digital technical intervention report on the tablet to sum up his activity and extra costs due to the usage of components not included in the original price.
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		Tablet.	



DAY 11: SERVICE DELIVERY



with a low grade but also to identify possible solutions or alternatives that can maintain the service quality without inconveniences.

A new prompt has been created and given to UX Builder SK and it is shown below:

You are working for a company that offers maintenance services for electrical systems and is looking to enhance the customer experience of Giovanni Bianchi, the persona described in the attached document, because the service provided currently has some issues. A service blueprint for this persona is also provided in the attachment, complete with ratings indicating Giovanni Bianchi's satisfaction levels throughout the service delivery process. Identify the critical stages with a low rating of the customer experience that need to be addressed and propose effective solutions for them.

Critical Stages with Low Ratings

1. Initial Call and Response:

- Rating: -2
- Issue: Giovanni felt frustrated and anxious about missing the initial call and having to reschedule.

2. Requesting Information:

- Rating: +1
- Issue: Giovanni was concerned about the high cost despite being relieved that the office followed up quickly.

3. Signing the Intervention Report:

- Rating: +1
- Issue: Giovanni found reviewing the report on the tablet acceptable but preferred paper formats.

4. Providing E-mail Address for Report:

- Rating: 0
- Issue: Giovanni was comfortable providing his e-mail but was concerned about potential spam and preferred a physical copy as well.

5. Making Payment:

- Rating: 0
- Issue: The payment process was smooth, but Giovanni felt the service was expensive.

Proposed Solutions

1. Improving Initial Call and Response:

- **Solution:** Implement an automated reminder system that sends text messages or emails to remind Giovanni about the scheduled calls and allows him to reschedule easily online if he misses the initial call. This can reduce frustration and anxiety by providing more control and flexibility.
- **Action:** Integrate a user-friendly scheduling and reminder system into the existing management software.

2. Transparent Cost Communication:

- **Solution:** Provide a detailed cost breakdown and transparent pricing information upfront on the company website and during initial communications. Include testimonials and case studies to justify the cost.
- **Action:** Update the communication scripts and website to include detailed pricing information and customer success stories.

3. Offering Preferred Report Formats:

- **Solution:** Give customers the option to choose between digital and paper reports. For digital reports, ensure they are easy to access and download, and consider adding a QR code for quick access.
- **Action:** Update the reporting system to allow the technician to ask the customer's preference and deliver the report accordingly.

4. E-mail Address Concerns:

- **Solution:** Assure customers that their e-mail addresses will only be used for service-related communication and provide an opt-in for other communications. Additionally, offer a physical report by mail if preferred.
- **Action:** Include a privacy assurance statement during the email collection process and offer a checkbox for opting in to additional communications.

5. Addressing Service Cost Concerns:

- **Solution:** Provide a value proposition during the service explanation, highlighting the benefits and long-term savings of

regular maintenance. Offer flexible payment options or discounts for repeat customers.

- **Action:** Train technicians and customer service representatives to emphasize the value and benefits of the service and update the payment system to include flexible payment plans.

The GPT identifies all the critical aspects of the service, including two additional stages where the ratings are equal to +1. This is not a problem but an opportunity to improve further aspects of the service.

To test the GPT's ability to transform the current service delivery process into a new one with the mentioned improvements, a specific prompt has been created. This prompt is designed to develop a future state service delivery process, starting from the current state process and incorporating the UX Builder SK evaluation.

You are working for a company that offers maintenance services for electrical systems and is looking to enhance the customer experience of Giovanni Bianchi, the persona described in the attached document, because the service provided currently has some issues. A service blueprint for this persona is also provided in the attachment, that represents the current state process. Generate a future state process from the current state one, implementing the solutions proposed.

The result is represented below in Figure 4.5. The content is entirely generated by UX Builder SK, except for the structure, which is created in Excel and the arrows that describe the information flow.

DAY 1: PRE-SERVICE			
TIMELINE	1 min	10 min	5 min
PHYSICAL EVIDENCE			Automated reminder system sends text or email to the customer.
CUSTOMER ACTIONS			Customer can confirm or reschedule the appointment online.
LINE OF INTERACTION			Customer responds and requests information regarding cost and duration.
FRONTSTAGE ACTIONS			The system automatically attempts to contact the customer.
LINE OF VISIBILITY			The technical office provides a detailed cost breakdown, duration, and what will be done.
BACKSTAGE ACTIONS	The technical office receives an automated reminder that the semestral routine maintenance for the customer must be	The technical office verifies the type of intervention, geographical location, duration, and predetermines the price.	
LINE OF INTERNAL INTERACTION			
SUPPORT PROCESSES	Management software sends notifications to the technical office for scheduling.	Google Maps, updated price list.	
NOTES			More control and flexibility for the customer, reducing frustration.

DAY 11: SERVICE DELIVERY

15 min	120 min	10 min	1 min
Equipment, safety system.	Order and cleanliness.		Communication method.

			Customer is informed of the intervention's conclusion.
--	--	--	--



Technician brings equipment to the designated location, secures the area, and begins the intervention.	Technician completes the intervention.	Technician fills out a digital technical intervention report on the tablet, summarizing activity and extra costs.	Technician informs the customer by phone.
--	--	---	---

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	Tablet.	Report is transparent and includes detailed cost breakdown.	
--	---------	---	--

DAY 11: SERVICE DELIVERY

2 min	1 min	1 min	2 min
Communication method, intervention report, tablet.	Communication method.	Intervention report.	Communication method.
Reviews intervention details and signs report.	Provides email address.	Receives signed report via email or physical copy.	Makes payment.
Technician shows the report on the tablet for signature and approval.	Technician asks for email address to send the report.	Technician sends signed report to the customer and technical office.	Technician asks for payment method and processes payment.

		Technical office schedules next maintenance in management software.	

			POS.
Customer can choose between digital and paper reports.			

DAY 11: SERVICE DELIVERY		DAY 15: POST-SERVICE		
15 min	5 min	2 min	10 min	
Payment receipt.			Invoice.	
Receives payment receipt			Receives invoice copy via email and tax drawer.	

Technician provides receipt, collects equipment, and departs.				

Technician delivers payment receipt to the office.	Technical office collects payment receipts and combines them with printed digital intervention reports.	Technical office adds material used administration office.	Administration office creates electronic invoice using saved customer data.	

			Management software.	

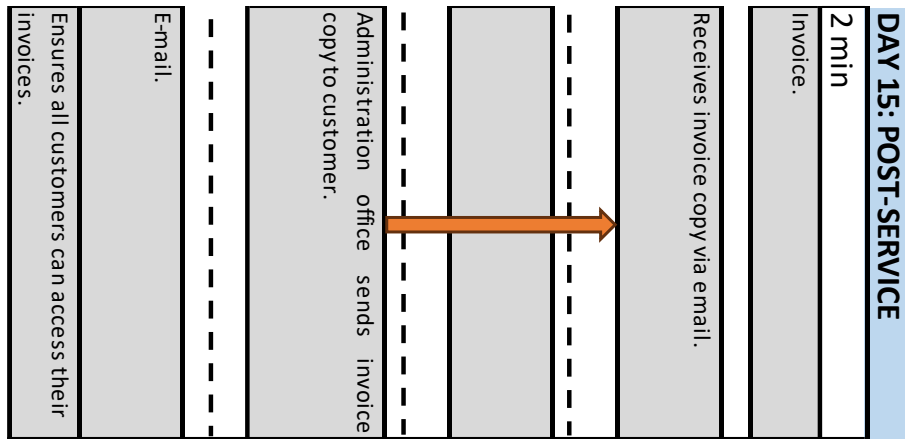


Figure 4.5: visual representation of the service blueprint improved by UX Builder SK.

To complete the test, it is necessary to evaluate the customer experience from the perspective of Giovanni Bianchi. To achieve this, it is crucial to simulate an interview of Giovanni Bianchi using GPT-4, focusing exclusively on the aspects modified in the service blueprint. This approach is necessary otherwise, the GPT might generate all ratings without considering the improvements made.

You are working for a company that offers maintenance services for electrical systems that is looking to enhance the customer experience of its service delivery process. A service blueprint of the current process has been provided, which includes ratings representing the customer's satisfaction level (where -3 indicates poor satisfaction and +3 indicates high satisfaction). This blueprint has been updated to a future state version, modifying the aspects that received negative feedback in the current process. Generate questions to interview the given persona, collecting information about his satisfaction concerning the changes compared to the current process. These questions should facilitate the construction of the customer's emotional journey through the future state process, enabling a comparison with the current state process.

The questions obtained are:

1. Initial Contact and Scheduling:

- The new process includes automated reminders via text or email to confirm or reschedule appointments online. How do you feel about this change? Do you think it will improve your scheduling experience compared to the current process?

2. Transparency and Cost Information:

- The future process includes a detailed cost breakdown and transparent pricing information upfront. Do you believe this new approach will address your previous concerns about cost transparency and enhance your satisfaction?

3. Report Format and Delivery:

- The new process allows you to choose between digital and paper reports. How do you feel about having this option? Will it enhance your experience with receiving and reviewing service reports?

4. Communication and Follow-Up:

- The future state includes proactive communication and flexible scheduling. How do you think this change will impact your experience with the service?

5. Payment Process:

- The new system aims to offer flexible payment options and highlight the value and benefits of the service during the explanation. How do you think these changes will affect your satisfaction with the payment process?

6. Overall Satisfaction:

- Based on the proposed improvements in the future state blueprint, how do you anticipate your overall satisfaction with the service will change? Are there any additional suggestions you have to further enhance the service?

As stated before, the questions are used to generate an interview with Giovanni Bianchi, using GPT-4 and the following prompt:

You represent Giovanni Bianchi, a customer of a company that offers maintenance services for electrical systems, as depicted by the provided persona. Simulate an interview using the following questions to answer in relation to the provided service blueprints, knowing that Giovanni Bianchi has taken an interview about the current state process.

...here are reported the questions...

The interview obtained is represented in the Appendix.

UX Builder SK is then used to analyse the simulated interview of Giovanni Bianchi to determine his level of satisfaction. The same prompt used in the current state process is used.

You are working for a company that offers maintenance services for electrical systems and is looking to enhance the customer experience for Giovanni Bianchi during the service delivery process, as outlined in the service blueprint.

Based on Giovanni Bianchi's interview, rate the satisfactory level of Giovanni Bianchi's experience for each customer action in the service delivery process, from -3 to +3, where +3 indicates a highly positive experience, -3 indicates a highly negative experience, and 0 is neutral.

This will create the emotional journey of the customer journey map.

1. Initial Contact and Scheduling:

- Action: Automated reminders via text or email to confirm or reschedule appointments online

- Rating: +3
- Reason: Giovanni feels very positive about the change as it addresses his frustration with the current manual rescheduling process and reduces anxiety about missing communications.

2. Transparency and Cost Information:

- Action: Providing a detailed cost breakdown and transparent pricing information upfront
- Rating: +3
- Reason: Giovanni appreciates the detailed cost breakdown upfront, which helps him budget better and feel more comfortable with the service.

3. Report Format and Delivery:

- Action: Option to choose between digital and paper reports
- Rating: +3
- Reason: Giovanni values the flexibility of choosing between digital and paper reports, enhancing his experience by catering to his preferences.

4. Communication and Follow-Up:

- Action: Proactive communication and flexible scheduling
- Rating: +3
- Reason: Giovanni believes proactive communication and flexible scheduling will make the service more responsive and easier to fit into his schedule, improving his overall experience.

5. Payment Process:

- Action: Flexible payment options and highlighting the value and benefits of the service during the explanation
- Rating: +3
- Reason: Giovanni welcomes flexible payment options and clear explanations of the service's value, making him feel more justified in spending the money and managing his finances better.

6. Overall Satisfaction:

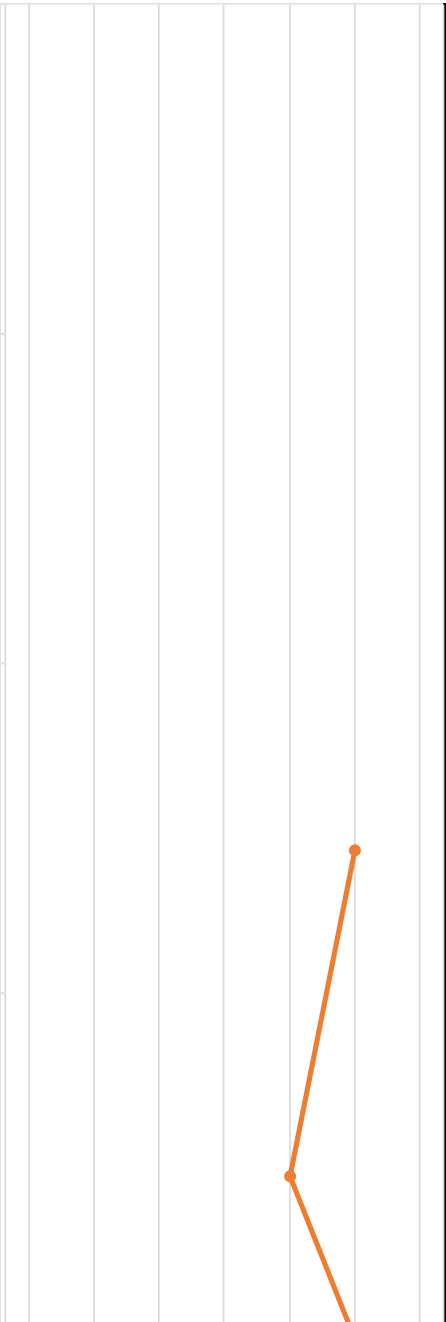
- Action: Implementing the proposed improvements in the future state blueprint
- Rating: +3
- Reason: Giovanni anticipates significant improvement in overall satisfaction with the proposed changes, addressing key areas of frustration and suggesting additional enhancements like a loyalty program.

The outcome is visually represented in Figure 4.6, where the new ratings are added. The ratings that are not mentioned have a rating equal to those of the current state process, because no changes have been made.

DAY 1: PRE-SERVICE				
TIMELINE	1 min	10 min	1 min	5 min
PHYSICAL EVIDENCE			Automated reminder system sends text or email to the customer.	Communication method.
CUSTOMER ACTIONS			Customer can confirm or reschedule the appointment online.	Customer responds and requests information regarding cost and duration.
LINE OF INTERACTION	-----			
FRONTSTAGE ACTIONS			The system automatically attempts to contact the customer.	The technical office provides a detailed cost breakdown, duration, and what will be done.
LINE OF VISIBILITY	-----			
BACKSTAGE ACTIONS	The technical office receives an automated reminder that the semestral routine maintenance for the customer must be performed.		The technical office verifies the type of intervention, geographical location, duration, and predetermines the price.	
LINE OF INTERNAL INTERACTION	-----			
SUPPORT PROCESSES	Management software sends notifications to the technical office for scheduling.	Google Maps, updated price list.		
NOTES	More control and flexibility for the customer, reducing frustration.			

3	
2	
1	
0	
-1	
-2	
-3	

DAY 1: PRE-SERVICE		DAY 10: PRE-SERVICE		DAY 11: SERVICE DELIVERY	
10 min	15 min	2 min	15 min		
		Communication method.	Vehicle, clothing.		
		Customer responds and confirms their presence.	Welcomes technician, discusses any concerns.		
		Technician calls customer five minutes before arrival.	Technician arrives, confirms work to be done, explains process and timeline.		
The technical office schedules the intervention in the management software, including customer's data and activity details.		Technician checks scheduled interventions on their personal tablet, prepares necessary equipment.			
	Management software, tablet, warehouse.				
		Customer is informed and prepared for the visit.			



DAY 11: SERVICE DELIVERY

15 min	120 min	10 min	1 min
system.	Order and cleanliness.		Communication method.
			Customer is informed of the intervention's conclusion.

Technician brings equipment to the designated location, secures the area, and begins the intervention. Technician completes the intervention. Technician fills out a digital technical intervention report on the tablet, summarizing activity and extra costs. Technician informs the customer by

--	--	--	--

	Tablet.	Report is transparent and includes detailed cost breakdown.	
--	---------	---	--

Handwritten notes area with two orange lines and dots.

DAY 11: SERVICE DELIVERY

2 min	1 min	1 min	2 min
Communication method, intervention report, tablet.	Communication method.	Intervention report.	Communication method.

Reviews intervention details and signs report.	Provides email address.	Receives signed report via email or physical copy.	Makes payment.
--	-------------------------	--	----------------

Technician shows the report on the tablet for signature and approval.	Technician asks for email address to send the report.	Technician sends signed report to the customer and technical office.	Technician asks for payment method and processes payment.
---	---	--	---

		Technical office schedules next maintenance in management software.	
--	--	---	--

Customer can choose between digital and paper reports.			POS.
--	--	--	------

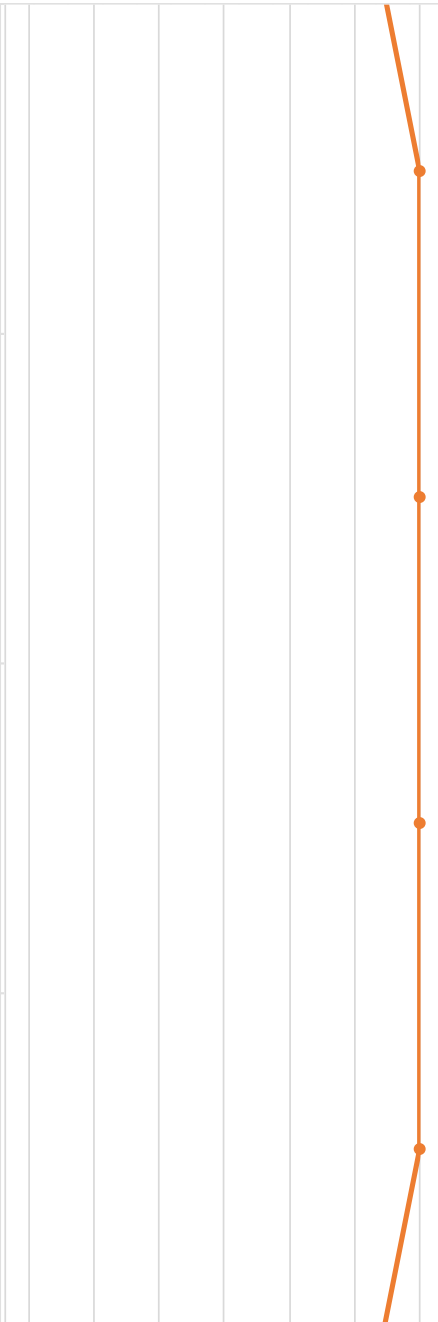


Figure 4.6: visual representation of the service blueprint with the emotional journey generated by UX Builder SK of an improved real service.

4.4.4 Observations

The final experiment underscores the valuable contribution of large language models in service design. It demonstrates the behaviour of GPTs in real situations, proving to be valuable in several aspects. Firstly, it confirms their ability to understand the context of tasks through short natural language prompts, which are integrated with documents if necessary. This is relevant since it enables users to generate the desired outcome using just a few words, avoiding the need of specific terms or engineer complex prompts, making it an accessible tool for everyone regardless of their background. In service design, this aspect is crucial since the moment that service design teams are composed of interdisciplinary people.

Secondly, in this case, the GPT generates a new service blueprint that could potentially enhance customer experience. This enhancement is theoretical and needs to be tested in a real context to verify the effectiveness of the proposed solutions, but from an external perspective, they appear sensible, achievable and functional.

The GPT again demonstrates its capability to analyse real cases, including interviews, and personas, capturing not only the context but also the essential meaning. This capability is evidenced by the pertinent questions it generates, the evaluation of the service blueprint, and the solutions it proposes.

However, this test has some limitations related to the lack of data and resources. The test could be more realistic if real interviews were incorporated into the experiment, allowing the generation of an actual customer journey map. This is hard to achieve due to the lack of a dataset of interviews or customer feedback within the analysed company. For this reason, a valuable future contribution would be to collect real feedback from a pool of customers and attempt to implement the solutions proposed by the GPT.

CONCLUSIONS

In conclusion, this thesis has explored the potential of Large Language Models (LLMs) in the field of service design, with particular attention to the integration of advanced technologies like GPT-4 to enhance traditional tools such as personas, service blueprint and customer journey maps.

This exploration follows an introduction to the two domains: service design and LLM. The first topic introduces the double diamond model, underling the importance of divergent and convergent thinking in creative activities and highlighting these necessities during experimentation. Accompanied by this, there is an introduction and explanation of the three previously mentioned tools, which are the objects of experimentation.

After capturing the essence of service design, LLMs are introduced and explained to less experts, facilitating the comprehension of the attention mechanism, that allows the generation of outputs as demonstrated in following experiments.

The major contribution is given by the test phase, where GPTs are employed to demonstrate a method to enhance service design. Indeed, LLMs prove to be a valuable assistant in the two core thinking phases of service design: divergent and convergent thinking. Indeed, they enrich idea generation with hundreds of ideas in just a few minutes, which can inspire or even be directly used in these activities. At the same time, their generative abilities can be easily translated into a convergent analysis that provides specific solutions to limit a huge amount of information.

The experiments show that LLMs can be considered a valuable tool for service design. They are particularly effective when used as assistants for less experienced users who need support in developing these tools, or for more

experienced users who need to speed up time consuming tasks or solve critical problems.

Even if LLMs are valuable tools, they must be always accompanied by human analysis that verify results. This is essential because they can produce hallucinations.

For future developments, a significant contribution could come from using real datasets, particularly real customer feedback, to enable a realistic evaluation of emotions. Indeed, when asked to generate something from scratch, there is a high probability that GPTs may produce hallucinations or incorrect results. While this does not mean that the analysis made in experimentation phase is useless, because it is a simulation of what it could happen if a certain customer behaves as described. However, the importance of using real data is demonstrated in chapter 3 and 4 with the application of real data in persona generation and service blueprint analysis.

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APPENDIX

Interviews generated for Persona Builder K (paragraph 3.3.2):

Interview 1

1. "My name is Marco Rossi, I'm 45, and I work as a factory manager."
2. "We need routine inspections every six months to ensure the electrical systems are compliant."
3. "Past services have been inconsistent, with delays and missed appointments."
4. "The main frustration has been with scheduling and reliability."
5. "I prefer email for documentation but calls for urgent matters."
6. "Promptness, professionalism, and thoroughness are most important."

Interview 2

1. "I'm Elena Bianchi, 32 years old, and a real estate agent."
2. "For residential properties, we need inspections every few years or during property turnover."
3. "Services have been decent, but sometimes technicians aren't well-prepared."
4. "Unreliable quotes and scheduling issues have been frustrating."
5. "Email works best for me."
6. "Accuracy, punctuality, and clear communication matter most."

Interview 3

1. "My name is Giuseppe Esposito, I'm 60, and I'm an electrical engineer."
2. "We require annual checks for our office building."
3. "My experiences have been mixed; some companies deliver quality, others don't."
4. "Late arrivals and lack of transparency in pricing."
5. "I prefer communicating by phone."
6. "Competence, transparency, and fair pricing are critical."

Interview 4

1. "I'm Chiara De Luca, 40 years old, and a school administrator."
2. "We require inspections every year for compliance purposes."
3. "Past services have generally been satisfactory."
4. "Coordinating with multiple providers can be frustrating."
5. "Email is the most convenient."
6. "Reliability, cost, and ease of coordination are vital."

Interview 5

1. "My name is Luca Conti, 50, and I'm a hotel manager."
2. "We need quarterly maintenance for our electrical systems."
3. "Services have been adequate but not exceptional."
4. "High costs and response times have been a challenge."
5. "Phone calls are preferred for quick communication."
6. "Responsiveness, expertise, and cost-effectiveness are most important."

Interview 6

1. "I'm Francesca Russo, 35 years old, and an architect."
2. "For my firm, we require biannual electrical system maintenance."
3. "Past services have been fairly positive."
4. "Sometimes, services are more expensive than expected."

5. "I prefer using email."
6. "Timeliness, accurate quoting, and professionalism matter most."

Interview 7

1. "My name is Davide Romano, I'm 42, and a logistics manager."
2. "We need monthly checks on our warehouse electrical systems."
3. "Services have generally met expectations."
4. "Frequent changes in technicians can be problematic."
5. "Phone and email work best."
6. "Consistency, expertise, and availability are crucial."

Interview 8

1. "I'm Laura Greco, 39, and I manage an apartment complex."
2. "We require yearly maintenance for the building's electrical systems."
3. "Past services have been reliable."
4. "Occasional delays in scheduling."
5. "Email is my preferred method."
6. "Reliability, responsiveness, and competitive pricing are key."

Interview 9

1. "My name is Andrea Marino, 29, and I'm an IT technician."
2. "We need maintenance every two years."
3. "It's been a positive experience overall."
4. "Lack of flexibility in scheduling can be a problem."
5. "Online chat or email."
6. "Efficiency, affordability, and professionalism are important."

Interview 10

1. "I'm Sofia Ferrara, 54 years old, and I own a retail store."
2. "We need quarterly checks for our store."
3. "Generally positive."
4. "High costs and limited availability can be issues."
5. "Phone calls work best."
6. "Timeliness, professionalism, and cost."

Interview 11

1. "My name is Matteo Bruno, 47, and I'm a facilities manager."
2. "Biannual maintenance for our office building."
3. "Services have been good."
4. "Sometimes, there's a lack of clarity on what's being charged."
5. "Phone and email."
6. "Professionalism, clear communication, and reliability."

Interview 12

1. "I'm Sara Parisi, 30, and I'm a marketing executive."
2. "We need annual inspections for our small office."
3. "It's been okay so far."
4. "Service delays can be frustrating."
5. "Email is best for me."
6. "Speed, competence, and communication."

Interview 13

1. "My name is Alessandro Ricci, I'm 39, and a building supervisor."
2. "Quarterly checks for our facility."
3. "Mixed experiences."
4. "The inconsistency in technician skill levels."
5. "Phone and email."

6. "Cost, reliability, and competence."

Interview 14

1. "I'm Valentina Sanna, 33 years old, and a project manager."
2. "We require annual checks for our company's headquarters."
3. "Fairly good."
4. "Sometimes, technicians aren't punctual."
5. "Phone for quick responses, email for documentation."
6. "Professionalism, transparency, and pricing."

Interview 15

1. "My name is Riccardo Grasso, 55, and I'm a hotel owner."
2. "Monthly maintenance for our large hotel."
3. "Quite satisfactory."
4. "Availability and high costs are challenges."
5. "Phone and email."
6. "Responsiveness, affordability, and quality."

Interview 16

1. "I'm Martina Costa, 45 years old, and a manufacturing plant manager."
2. "Quarterly inspections."
3. "Mixed. Some companies are reliable, others not."
4. "Scheduling and transparency issues."
5. "Phone and email."
6. "Quality, cost, and reliability."

Interview 17

1. "My name is Tommaso Leone, I'm 34, and an engineer."
2. "Annual inspections."
3. "Overall positive."
4. "Occasional delays."
5. "Email."
6. "Cost, reliability, and professionalism."

Interview 18

1. "I'm Francesca Barbieri, 50, and a school principal."
2. "Annual inspections for the school."
3. "Positive overall."
4. "Sometimes, availability is limited."
5. "Phone for urgent matters."
6. "Professionalism, reliability, and cost."

Interview 19

1. "My name is Luca Riva, 44, and a contractor."
2. "Quarterly maintenance for various projects."
3. "Generally satisfactory."
4. "Scheduling issues."
5. "Phone and email."
6. "Affordability, expertise, and professionalism."

Interview 20

1. "I'm Anna Fontana, 38, and I work in HR."
2. "Annual checks for our office."
3. "Mixed experiences."
4. "Delays and high costs."
5. "Email."
6. "Professionalism, reliability, and cost."

Interview 21

1. "My name is Federico Lombardi, I'm 29, and a restaurant owner."
2. "Quarterly checks."
3. "Positive experience overall."
4. "Pricing inconsistencies."
5. "Phone."
6. "Pricing, availability, and quality."

Interview 22

1. "I'm Giulia Valentini, 47, and an event planner."
2. "Biannual maintenance."
3. "Mixed. Some are reliable, some not."
4. "Scheduling and pricing issues."
5. "Email."
6. "Cost, quality, and reliability."

Interview 23

1. "My name is Michele Leone, I'm 34, and an architect."
2. "Annual checks."
3. "Mostly positive."
4. "Occasional delays."
5. "Email."
6. "Cost, quality, and reliability."

Interview 24

1. "I'm Elisa Galli, 52, and an office manager."
2. "Biannual maintenance."
3. "Mixed."
4. "Scheduling challenges."
5. "Phone and email."
6. "Cost, professionalism, and reliability."

Interview 25

1. "My name is Gabriele Sarti, 49, and a hotel manager."
2. "Monthly checks."
3. "Generally good."
4. "Availability can be limited."
5. "Phone."
6. "Affordability, reliability, and expertise."

Interview 26

1. "I'm Chiara Palmieri, 28, and a retail manager."
2. "Quarterly maintenance."
3. "Mixed."
4. "Delays and high costs."
5. "Email."
6. "Professionalism, quality, and cost."

Interview 27

1. "My name is Pietro De Angelis, I'm 36, and a hospital administrator."
2. "Annual inspections."
3. "Generally satisfactory."
4. "Availability and high costs."
5. "Phone and email."
6. "Quality, affordability, and responsiveness."

Interview 28

1. "I'm Laura Martini, 41, and a logistics manager."
2. "Biannual maintenance."
3. "Mixed."
4. "Availability and scheduling issues."
5. "Phone."
6. "Cost, reliability, and quality."

Interview 29

1. "My name is Stefano Fiore, I'm 50, and an industrial manager."
2. "Quarterly checks."
3. "Positive."
4. "Delays and high costs."
5. "Phone and email."
6. "Affordability, quality, and responsiveness."

Interview 30

1. "I'm Maria Sala, 37, and a property manager."
2. "Annual checks."
3. "Mostly positive."
4. "Scheduling issues."
5. "Email."
6. "Cost, quality, and reliability."

Interviews generated for Persona Builder WK (paragraph 3.3.2):

Interview 1:

1. "My name is Marco, I'm 42, and I manage an industrial facility."
2. "Your service is reliable but could improve communication around emergency services."
3. "We need regular checks on our heavy machinery and distribution systems."
4. "We schedule quarterly checks and allocate about €2,000 annually."
5. "Email works best for updates, but I'd prefer a call for emergencies."
6. "We recently had a power surge. We called your emergency line, and the technician arrived within two hours."

Interview 2:

1. "I'm Lucia, 34, residing in a residential building."
2. "Your services have been efficient, but I wish for shorter appointment windows."
3. "Regular maintenance for safety devices and switches is crucial."
4. "We schedule annual checks and set aside around €300."
5. "SMS notifications are perfect for me."
6. "A circuit breaker malfunctioned. I scheduled a visit online, and the technician arrived on time."

Interview 3:

1. "I'm Andrea, 50, and I run a small factory."
2. "The service is good, but there have been delays in the past."
3. "Ensuring the machinery's wiring is safe and up to code is essential."
4. "We set aside about €5,000 yearly for quarterly maintenance."
5. "I prefer emails for updates and WhatsApp for emergencies."
6. "Our equipment malfunctioned last month. We called the hotline and had to wait for a callback."

Interview 4:

1. "I'm Sofia, 27, and I live in a residential building."
2. "The service has been satisfactory, but I'd appreciate quicker response times."
3. "Regular checks for outlets and fuse boxes are important."
4. "I plan for about €150 annually."

5. "An email notification works best."
6. "A socket was sparking. The technician arrived within three hours after I called."

Interview 5:

1. "My name is Giuseppe, 61, and I own a commercial building."
2. "Overall, satisfied but felt updates on system upgrades could be better."
3. "It's crucial to maintain emergency lighting and ensure safety codes."
4. "We allocate about €3,500 per year for biannual maintenance."
5. "I'd prefer phone calls for all updates."
6. "We needed to update our wiring system. The technician assessed our needs and proposed a new setup."

Interview 6:

1. "I'm Marta, 39, residing in a townhouse."
2. "Service has been smooth, though I'd like more proactive checks."
3. "Maintaining the wiring for heating systems is crucial."
4. "We set aside around €200 per year."
5. "SMS updates work well for me."
6. "A heater malfunctioned last winter. I reached out via the app and got a response within a day."

Interview 7:

1. "I'm Lorenzo, 48, and I manage an industrial warehouse."
2. "Generally good service, but more transparency on costs would be appreciated."
3. "Maintaining the power distribution panels is crucial."
4. "We budget about €7,000 per year."
5. "Email notifications are ideal for us."
6. "A transformer needed replacement. The technician quickly identified the issue and provided a quote."

Interview 8:

1. "My name is Carla, 35, and I live in a condominium."
2. "Your services have been reliable, but there could be more flexibility in scheduling."
3. "Periodic checks on our backup power system are crucial."
4. "We set aside about €500 yearly."
5. "Email works best for me."
6. "We had a circuit issue. The technician arrived the next day after my online booking."

Interview 9:

1. "I'm Riccardo, 53, and I own a commercial property."
2. "Service has been efficient, but I'd like more information on new technologies."
3. "It's vital to maintain the circuit breakers and control panels."
4. "We budget about €2,500 annually."
5. "I'd prefer SMS for emergency updates."
6. "We had a power outage. The hotline directed me to the right technician quickly."

Interview 10:

1. "I'm Elena, 44, living in a residential house."
2. "Service has been okay, but I'd appreciate weekend availability."
3. "Maintaining circuit breakers and surge protectors is essential."
4. "We allocate around €250 yearly."
5. "Email notifications work best."
6. "Our power tripped repeatedly. A technician came within a day of my call."

Interview 11:

1. "I'm Francesco, 49, and I oversee a manufacturing plant."
2. "The service is good, but I'd like quicker turnaround times for emergencies."
3. "Maintaining equipment wiring and circuit boards is critical."

4. "We allocate €8,000 annually."
5. "Phone calls work best for urgent updates."
6. "A circuit board needed urgent repair. The technician came the same day."

Interview 12:

1. "I'm Chiara, 33, and I live in an apartment."
2. "The service has been okay, but I'd like more convenient appointment slots."
3. "It's important to maintain our apartment's electrical panel and wiring."
4. "We budget about €200 annually."
5. "Email notifications work best."
6. "A socket issue needed fixing. The technician arrived within two days of my call."

Interview 13:

1. "I'm Matteo, 45, and I manage a logistics facility."
2. "Generally positive experience, but emergency response times could be faster."
3. "Maintaining the power distribution network is critical."
4. "We allocate about €10,000 per year."
5. "Phone calls are preferred for emergencies."
6. "A power surge caused a blackout. The technician was dispatched promptly."

Interview 14:

1. "I'm Alessandra, 37, and I live in a duplex."
2. "Service is satisfactory, but quicker responses to online queries would help."
3. "Regularly maintaining lighting fixtures and outlets is vital."
4. "We plan for about €150 annually."
5. "SMS works best for me."
6. "Our lighting failed during a storm. I reached out online and got assistance within 24 hours."

Interview 15:

1. "I'm Federico, 55, and I manage an office building."
2. "Your service is generally good, but better transparency on fees would be appreciated."
3. "Maintaining the building's electrical grid is essential."
4. "We allocate about €4,000 per year."
5. "I prefer emails for updates and SMS for emergencies."
6. "An office floor lost power. The technician diagnosed and resolved the issue the next day."

Interview 16:

1. "I'm Giulia, 28, and I live in an apartment."
2. "The service has been fine, but faster scheduling would help."
3. "Maintaining outlets and power strips is crucial."
4. "We allocate around €120 per year."
5. "Email notifications work best."
6. "Our circuit breaker tripped repeatedly. The technician arrived within 48 hours."

Interview 17:

1. "I'm Stefano, 42, managing a retail store."
2. "Service has been reliable, but more flexibility in scheduling would help."
3. "Ensuring the lighting and wiring are safe is crucial."
4. "We allocate about €2,000 yearly."
5. "Emails are best for regular updates."
6. "A short circuit caused a blackout. The technician arrived within hours of my call."

Interview 18:

1. "I'm Francesca, 29, and I reside in a condominium."
2. "Your service is satisfactory, but I'd like more proactive maintenance suggestions."
3. "Maintaining electrical panels and lighting is crucial."
4. "We set aside around €300 annually."

5. "SMS updates work well for me."
6. "A circuit board needed repair. The technician arrived within two days."

Interview 19:

1. "I'm Davide, 48, managing a restaurant."
2. "The service has been good, but better clarity on maintenance plans would help."
3. "Maintaining the kitchen's electrical appliances is critical."
4. "We budget about €1,500 annually."
5. "Phone calls work best for all updates."
6. "An oven malfunctioned. The technician diagnosed the issue quickly."

Interview 20:

1. "I'm Martina, 34, and I live in a townhouse."
2. "The service has been okay, but I'd prefer quicker appointment times."
3. "Maintaining outlets and lighting fixtures is crucial."
4. "We plan for around €200 yearly."
5. "SMS notifications are ideal."
6. "A switch needed replacing. I called, and the technician came within 48 hours."

Interview 21:

1. "I'm Paolo, 57, and I run a manufacturing facility."
2. "Your service has been good, but weekend availability would help."
3. "Maintaining the machinery's wiring is vital."
4. "We budget about €12,000 per year."
5. "Phone calls work best for urgent updates."
6. "A machine malfunctioned, causing a power issue. The technician arrived promptly."

Interview 22:

1. "I'm Laura, 30, and I reside in an apartment."
2. "Service has been satisfactory, but I'd like more availability in the evenings."
3. "Maintaining outlets and the electrical panel is essential."
4. "We budget about €

150 annually."

5. "Email notifications are best."
6. "A socket was sparking. The technician arrived within three hours of my call."

Interview 23:

1. "I'm Simone, 43, managing an office building."
2. "Your service has been good, but quicker responses to emergency calls would help."
3. "Maintaining the electrical grid is crucial."
4. "We allocate about €3,000 per year."
5. "Emails are ideal for updates."
6. "A blackout occurred on one floor. The technician resolved the issue the next day."

Interview 24:

1. "I'm Valentina, 36, and I live in a house."
2. "The service has been fine, but I'd appreciate more proactive maintenance suggestions."
3. "Maintaining the circuit breaker and outlets is essential."
4. "We plan for around €200 annually."
5. "SMS notifications work best."
6. "A breaker needed replacement. The technician arrived within two days."

Interview 25:

1. "I'm Alessandro, 49, managing a commercial property."
2. "Service has been efficient, but better communication around new technologies would help."
3. "Maintaining the building's lighting and wiring is critical."

4. "We budget about €5,000 annually."
5. "Phone calls work best for all updates."
6. "A power surge damaged the lighting system. The technician arrived the same day."

Interview 26:

1. "I'm Irene, 32, and I reside in an apartment."
2. "Your service has been satisfactory, but I'd prefer more evening availability."
3. "Maintaining the circuit breaker and outlets is crucial."
4. "We allocate around €150 per year."
5. "Email notifications work best."
6. "A socket needed replacement. The technician came within 24 hours of my call."

Interview 27:

1. "I'm Michele, 50, overseeing a logistics center."
2. "The service has been reliable, but quicker turnaround times for emergencies would help."
3. "Maintaining the electrical grid is vital."
4. "We budget about €7,000 annually."
5. "Emails work well for updates."
6. "A blackout affected a section of the warehouse. The technician resolved the issue promptly."

Interview 28:

1. "I'm Maria, 38, and I live in a townhouse."
2. "The service has been satisfactory, but I'd like more proactive maintenance suggestions."
3. "Maintaining the outlets and circuit breaker is crucial."
4. "We set aside around €180 annually."
5. "SMS updates work well."
6. "A socket was malfunctioning. The technician came the next day."

Interview 29:

1. "I'm Luca, 45, managing a retail store."
2. "Your service is generally good, but emergency response times could be faster."
3. "Maintaining the lighting and wiring is critical."
4. "We allocate about €3,000 per year."
5. "Emails are best for updates."
6. "A short circuit caused a blackout. The technician arrived within hours."

Interview 30:

1. "I'm Stefania, 29, and I live in an apartment."
2. "Service has been okay, but better flexibility in scheduling would help."
3. "Maintaining the outlets and electrical panel is crucial."
4. "We budget about €180 per year."
5. "Email notifications work best."
6. "A circuit breaker malfunctioned. The technician came within two days."

Simulated Interview of Giovanni Bianchi (paragraph 4.4.2):

Day 1: Pre-Service

1. Customer doesn't respond to the initial call:

Interviewer: "Giovanni, how did you feel when you noticed the missed call from the maintenance service?"

Giovanni: "I felt a bit frustrated because I had been expecting their call, and missing it made me anxious about rescheduling."

Interviewer: "What were your immediate thoughts or concerns upon seeing the missed call?"

Giovanni: "My first thought was that I might have missed some important information about the maintenance schedule. I was worried it might delay the service."

Potential Issues:

- Anxiety and frustration due to missed communication.
- Concerns about rescheduling and delays.

2. Customer responds and requests information:

Interviewer: "How did you feel when you received the follow-up call from our technical office?"

Giovanni: "I felt relieved that they followed up quickly. It showed they were on top of things."

Interviewer: "Was the information regarding the cost and duration of the intervention clear and satisfactory?"

Giovanni: "Yes, the information was clear, but I did feel the cost was quite high, which made me hesitant."

Interviewer: "Did you find it easy to communicate your availability for the maintenance appointment?"

Giovanni: "Yes, it was straightforward. They were flexible with the timing."

Potential Issues:

- Perception of high costs causing hesitation.
- Need for clear communication to ensure understanding.

Day 11: Service Delivery

3. Customer confirms their presence:

Interviewer: "How did you feel when you received the confirmation call from the technician about their arrival?"

Giovanni: "I appreciated the confirmation. It reassured me that they were coming as scheduled."

Interviewer: "Was the timing of the call convenient for you?"

Giovanni: "Yes, the call was made at a convenient time."

Potential Issues:

- Importance of timely and reassuring confirmation.

4. Customer welcomes the technician:

Interviewer: "How did you feel about welcoming the technician into your home?"

Giovanni: "I was a bit apprehensive about having someone new in my home but felt better when the technician arrived."

Interviewer: "Was the technician's arrival on time, and did they appear professional?"

Giovanni: "The technician was on time and looked professional, which helped put me at ease."

Potential Issues:

- Initial apprehension about allowing strangers into the home.

5. Customer sees the technician securing the area and starting the intervention:

Interviewer: "How did you feel watching the technician secure the area and begin the maintenance work?"

Giovanni: "I felt confident seeing them secure the area. It showed they were serious about safety."

Interviewer: "Did the technician explain the steps they were taking to ensure safety and thoroughness?"

Giovanni: "Yes, they explained each step, which I found very helpful and reassuring."

Potential Issues:

- Importance of clear communication regarding safety procedures.

6. Customer informed of the intervention completion:

Interviewer: "How did you feel when you were informed that the maintenance was completed?"

Giovanni: "I was glad the work was done on time and relieved it went smoothly."

Interviewer: "Was the communication about the intervention's completion clear and satisfactory?"

Giovanni: "Yes, it was clear and satisfactory."

Potential Issues:

- Need for clear communication upon completion of service.

7. Customer reviews and signs the intervention report:

Interviewer: "How did you feel reviewing the intervention report on the technician's tablet?"

Giovanni: "Reviewing the report was fine, though I prefer paper to digital formats."

Interviewer: "Were all the details, including any extra costs, explained to your satisfaction?"

Giovanni: "Yes, everything was explained well."

Potential Issues:

- Preference for paper over digital formats.

8. Customer provides an e-mail address for the report:

Interviewer: "How did you feel about providing your e-mail address for receiving the intervention report?"

Giovanni: "I was comfortable providing my e-mail address, but I hope they don't spam me with other messages."

Interviewer: "Is receiving the report via e-mail your preferred method of communication?"

Giovanni: "It's convenient, but I also like having a physical copy."

Potential Issues:

- Concerns about potential spam.
- Preference for both digital and physical copies.

9. Customer receives the intervention report via e-mail:

Interviewer: "How did you feel when you received the signed intervention report in your e-mail?"

Giovanni: "Receiving the report promptly was great, and it was clear and detailed."

Interviewer: "Was the report easy to understand and did it contain all the necessary details?"

Giovanni: "Yes, it was comprehensive and easy to understand."

Potential Issues:

- Ensuring clarity and comprehensiveness in the report.

10. Customer makes the payment:

Interviewer: "How did you feel about the payment process for the maintenance service?"

Giovanni: "The payment process was smooth, but again, I felt the service was expensive."

Interviewer: "Was the payment method convenient and efficient for you?"

Giovanni: "Yes, it was convenient."

Potential Issues:

- Perception of high costs.

11. Customer receives the payment receipt:

Interviewer: "How did you feel when you received your payment receipt?"

Giovanni: "I felt reassured having the receipt for my records."

Interviewer: "Was there anything about the payment process or receipt that could be improved?"

Giovanni: "No, the process was fine."

Potential Issues:

- Ensuring the receipt process is efficient and clear.

Day 15: Post-Service

12. Customer receives a copy of the invoice:

Interviewer: "How did you feel when you received the invoice in your tax drawer?"

Giovanni: "It was convenient to have it in the tax drawer, though I did need some help accessing it."

Interviewer: "Was the invoice clear and accurate? Did it match your expectations?"

Giovanni: "Yes, it was clear and accurate."

Potential Issues:

- Potential difficulty accessing the tax drawer.

13. Customer receives a copy of the invoice via e-mail:

Interviewer: "How did you feel about receiving the invoice via e-mail as well?"

Giovanni: "It was helpful to have it both ways, but I hope it's not redundant."

Interviewer: "Is receiving the invoice through multiple channels beneficial for you?"

Giovanni: "Yes, it ensures I don't miss it, but one clear communication would be sufficient."

Potential Issues:

- Balancing multiple communication channels to avoid redundancy.

Simulated Interview of Giovanni Bianchi (paragraph 4.4.3):

1. Initial Contact and Scheduling:

- Question: The new process includes automated reminders via text or email to confirm or reschedule appointments online. How do you feel about this change? Do you think it will improve your scheduling experience compared to the current process?

- Answer: I feel very positive about this change. The current process, where I sometimes miss calls and have to reschedule manually, is frustrating and time-consuming. Automated reminders and the ability to manage appointments online will make it much easier to coordinate with my busy schedule and reduce anxiety about missing important communications. This change will definitely improve my scheduling experience.

2. Transparency and Cost Information:

- Question: The future process includes a detailed cost breakdown and transparent pricing information upfront. Do you believe this new approach will address your previous concerns about cost transparency and enhance your satisfaction?

- Answer: Yes, providing a detailed cost breakdown upfront addresses one of my main concerns. In the current process, the costs sometimes feel unexpected and high, which causes hesitation. Knowing the costs in advance will help me budget better and feel more comfortable with the service, enhancing my overall satisfaction.

3. Report Format and Delivery:

- Question: The new process allows you to choose between digital and paper reports. How do you feel about having this option? Will it enhance your experience with receiving and reviewing service reports?

- Answer: Having the option to choose between digital and paper reports is a great improvement. While I generally prefer digital reports for convenience and eco-friendliness, having the option for a paper copy is useful for situations where I might need a physical document. This flexibility will enhance my experience by catering to my needs and preferences.

4. Communication and Follow-Up:

- Question: The future state includes proactive communication and flexible scheduling. How do you think this change will impact your experience with the service?

- Answer: Proactive communication and flexible scheduling are crucial improvements. The current process can be a bit rigid and sometimes leaves me feeling unsure about the next steps. These changes will make the service more responsive and easier to fit into my schedule, improving my overall experience and reducing stress.

5. Payment Process:

- Question: The new system aims to offer flexible payment options and highlight the value and benefits of the service during the explanation. How do you think these changes will affect your satisfaction with the payment process?

- Answer: Flexible payment options and clear explanations of the service's value are very welcome changes. The current process feels straightforward but sometimes the costs seem high without enough context. Highlighting the benefits will make me feel more justified in spending the money, and flexible payment options will make it easier to manage my finances, thereby increasing my satisfaction.

6. Overall Satisfaction:

- Question: Based on the proposed improvements in the future state blueprint, how do you anticipate your overall satisfaction with the service will change? Are there any additional suggestions you have to further enhance the service?

- Answer: I anticipate my overall satisfaction will significantly improve with these proposed changes. The improvements in communication, scheduling, cost transparency, and flexibility all address key areas where I currently experience frustration. One additional suggestion would be to implement a loyalty program or discounts for regular customers, which would not only incentivize continued business but also make me feel valued as a long-term customer.