



## Combining machine learning and Service Design to improve customer experience

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### Abstract

Service design is an effective approach for service-based businesses to improve customer experience. However, Double Diamond design process has limitations in identifying the development areas with most business impact. Combining service design process with machine learning presents a new opportunity for alleviating the aforementioned limitation. We present a case from a European service design agency and a Nordic life insurance company to describe the utilization of machine learning in the beginning of the service design process. With this new process we were able to quantify business impact of different customer experience factors and focus the design effort towards the most potential area. Additionally, we increased the buy-in from top management by enhancing the credibility of the qualitative approach with numeric evidence of customer experience data. The work resulted in increased Net Promoter Score for the client organization.

Keywords: customer experience, machine learning, service design, impact of design, net promoter score, double diamond process

## Introduction

Integrating machine learning into design processes is one of the hot topics both in industry and academia. Although machine learning and large amounts of data have a potential to lead to innovative new services (Antons & Breidbach, 2018), it is not easy for design teams to find the ways of utilising them in service design or interaction design projects (Dove et al., 2017). There is a lack of articles that present theoretical or practical case examples to learn from. As a design agency based in Europe, we have been successfully exploring the role of machine learning and analysing large amounts of data in a few service design projects. This paper reports one of these projects, a case study with a Nordic life insurance company in 2017, to share one of our solutions for using machine learning in service design.

In service design practice, a Double Diamond process is typically applied to improve service experiences (British Design Council, accessed 2019). Qualitative research is used to gather insights and map the pain points of customers as well as the opportunities that can reach business targets (Diamond one). These insights are used to move the design phase that includes idea generation, concept development and prototyping to come up with solutions (Diamond two). The Double Diamond process was developed 15 years ago, but since then, design has developed to “solve more complex, multi-faceted challenges” (British Design Council, 2019). This is one reason why many companies have expanded the Double Diamond to Triple Diamond. However, none of the Triple Diamond processes that we have seen have introduced a machine learning approach in the beginning of the design process. Also, we have not found this approach addressed in scientific publications.

In this paper, we describe a case study where our machine learning-based analysis method was added in front of the Double Diamond design process. We call this quantitative analysis method "conversion analysis". It identifies the optimal development targets with respect to a selected key performance indicator (KPI). This helps service designers to focus their efforts on development targets with high estimated return of design effort. The conversion analysis is described briefly in the next section. **The business target of our client was to increase their Net Promoter Score (NPS) values by improving their customer experience.** Therefore, we used NPS as the main KPI. Our conversion analysis was able to identify the most impactful development targets for increasing the NPS ratings. We were able to design a customer-centric, actionable and provably NPS-optimal service identity for the organisation.

Based on our observations, adding the machine learning-based conversion analysis in the beginning of design process provided two major benefits: **increased buy-in from top management** and **higher impact of design work**. This approach created one more phase: "A Diamond Zero", before the actual start of the Double Diamond design process.

It is important to acknowledge that machine learning is a large scientific field with numerous methods, subtopics and subfields. Conversion analysis is our analysis method, which utilizes machine learning to perform KPI predictions. The initial "Diamond Zero" is the generalization of our experiences where the machine learning component can implement any analysis to steer design effort (e.g. segmentation of customer data). In this case, the conversion analysis was the machine learning component in "Diamond Zero" when we worked with the Nordic life insurance company. However, in future, we are planning to write more about the "Diamond Zero" itself with multiple examples of how we have utilized machine learning prior to design work (not only conversion analysis).

The following section describes the utilization of our conversion analysis in the design project. We also present the new diamond, focusing on machine learning in our proposed Triple Diamond process.

## **Method: Machine learning for service design**

The collaboration with the Nordic life insurance company started with a deep dive into the available customer experience data. The data consists of totally anonymous individual customer feedback (slightly less than 10,000) relating to three service qualities that affect the customer experience. In our work, service qualities are called customer experience factors. The following three customer experience factors were available in the data:

1. Professionalism of customer service
2. Feeling that the organization cares about the customer
3. Perceived speed of the customer service

The assumption of top management was that the perceived expertise of the front-line personnel (Professionalism of customer service) has the biggest impact on the customer experience. They also believed that negative changes on the stock market have a negative impact on the NPS. To validate this assumption, we included stock exchange data of the most traded assets in two relevant European countries synchronized by

the response date of the respondents. We also added data about internal load that affects the delivery of customer service.

We applied our machine learning-based analysis method, called conversion analysis, to the aforementioned data to identify the design focus with the most impact for the customer experience (NPS as KPI). This analysis was done before commencing the design work (qualitative customer research and designing new service identity). So, conversion analysis predicted which (combinations of) customer experience factors have the greatest potential for improving customer experience by estimating the potential NPS conversion for all combinations of customer experience factors upon improvement. The following high-level steps are utilized by our conversion analysis to identify the optimal design opportunity with respect to KPI:

- Train a machine learning model to predict the NPS segment (detractors, neutrals and promoters) for each individual customer in the dataset.
- Use the trained prediction model to simulate the potential change in NPS segment if any combination of the key customer experience factors is improved.
- Identify the customer experience factors that, if improved, result in the optimal increase (conversion) of individual customers into a higher NPS segment.

Notice that the conversion analysis is not based on a simple linear regression analysis. Instead, it uses a machine learning classifier that utilizes nonlinear dependencies in its predictions. Based on our experience of utilizing the machine learning-based conversion analysis in this case, we propose the addition of a new diamond in the beginning of the established Double Diamond process. Figure 1 illustrates our proposed Triple Diamond design process to ensure impact and top management buy-in for the design work based on our experiences when working with the Nordic life insurance company. The first diamond is our contribution for the design process. The remaining diamonds are already present in the established Double Diamond process. The new diamond ("Diamond zero", Model and Focus) contains the following phases and activities:

#### **Phase: Model**

- Form a research question that will provide useful insight for design effort.

- Define the customer experience factors and acquire relevant, high-quality data for the research question.
- Select machine learning algorithms or analysis methods. This does not only mean our conversion analysis. For example, a clustering algorithm could be utilized for customer data.
- Analyse the data.

### Phase: Focus

- Assess the analysis results carefully.
- Form a prioritized focus for the discovery phase of the design process.

In the "Model" phase, research questions are formed to steer the analysis and its requirements: do we need to obtain data, which machine learning algorithm is applicable, will the results be useful for the design phase. For example, numerical customer feedback could be collected from a feedback panel for our conversion analysis to identify optimal opportunity areas. In the "Focus" phase, the utilized data is analysed using machine learning and the analysis results are carefully assessed. For example, the numerically second-best option could be the most cost-effective opportunity area for the client. The outcome of this assessment, and the first diamond, is a brief for the design phase and where to focus the qualitative research.

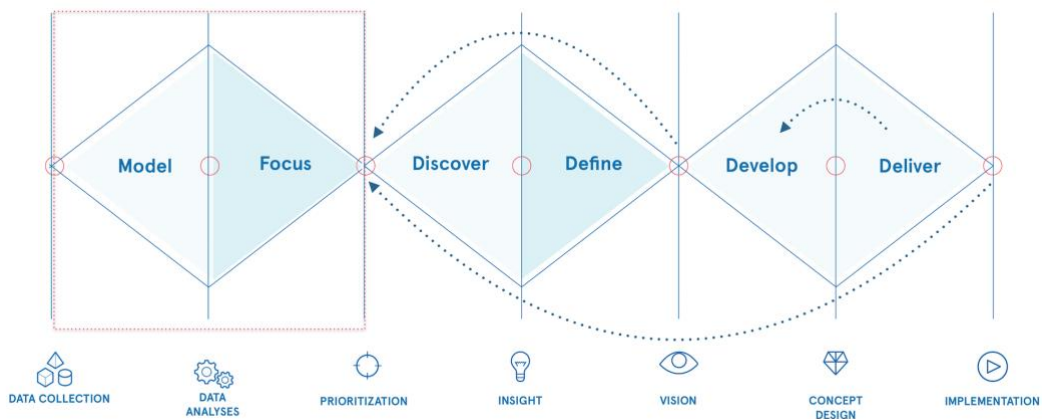


Figure 1: Our proposed Triple Diamond design process to ensure impact and top management buy-in for the design work.

## Results

One of the first things our conversion analysis was able to prove was, contradicting the general belief within the client organization, that the performance of the stock exchanges did not have a significant effect on the customer NPS. There was no significant relationship identified between the development of stock prices and customer satisfaction scores. This was a surprise to the client organization, which now had to rethink the emphasis between different factors affecting customer experience. Also, there was no link between the internal load of the organization with respect to the NPS.

Among the three key factors, the conversion analysis showed it was the feeling of caring that had the biggest potential to increase the NPS of the individual customers. This factor refers to the customer's feeling of being cared for by the organization. This was an especially surprising outcome since the top management assumed that the professionalism of customer service was the most important customer experience factor. However, feeling of caring proved to have two times more impact than professionalism, which the conversion analysis ranked second. Professionalism was considered merely as a basic function of the expert organisation by the customers and was not a significant customer experience factor.

Notice that our conversion analysis does not say that professional customer support is not important for customers. The correct interpretation is that the current level of professionalism is good enough and its development does not increase the NPS as well as the development of feeling of caring does. Our conversion analysis estimates the potential impact, not the current level.

### Foundation for the design process

The outcome of the conversion analysis became the starting point of the service design project, which follows a more typical Double Diamond process. The feeling of caring proved to be an interesting focus for customer and employee research, which was conducted to understand this customer experience factor more deeply. The feeling of caring as a “soft” design driver was seen to be in contrast with the existing brand image of the life insurance company. During the design process we recognized that these contrasts actually create a unique mix, when a soft and empathetic feeling of caring meets the masculine and powerful brand image. This finding also resonated well with customers and employees

involved in qualitative research. We translated this understanding into the design of a new service identity for the life insurance company. The new service identity focused especially on actions that increase the perceived feeling of caring for the customers. The service identity was communicated in the form of a guidebook and an operating model for strengthening the feeling of caring in all customer encounters and service channels. Furthermore, several touchpoints were co-designed and tested with the employees to help implement a new service identity (see about service prototypes e.g. in Blomkvist & Holmlid, 2010).

### **Improved Customer Experience**

The impact of the design actions coordinated around the feeling of caring can now be clearly witnessed in the responses from their customers and their NPS, which immediately increased after the new service identity was launched. The life insurance company thus achieved their goals and they can now prove it with straightforward data from the NPS. Also, the number of sales leads generated by customer service personnel increased significantly after starting to utilise new service identity which promoted more holistic and active customer service.

### **Top management buy-in**

Our conversion analysis results were initially quite surprising for the managers in the client organization since they conflicted with their presumptions. Our previous experience shows that such a radical change would not have gained top management buy-in if the results were purely based on qualitative data e.g. interviews only, especially in this sort of traditional business field. The conversion analysis increased reliability of the outcomes and the evidence, based on a large amount of data, was harder to dismiss. This case study shows how combining machine learning with the service design process can help to increase the trust and buy-in of top management, especially if they are used to dealing with numeric data as the basis of decision making.

## **Conclusions**

The case reported in this paper demonstrated how machine learning-based models can guide the design process to the right direction for the outset. When the assignment of the client company is as open as in this case, the conversion analysis is a promising tool, which provides focus for

the initial customer interviews and the whole service identity of the organization. The new service identity provides the client company with an inspiring angle from which to invent new services. According to Dove et al. 2017, this case contributes to the least frequent type of machine learning in design, that is, the design team generating novel concepts utilizing machine learning.

From the perspective of a design agency, the most intriguing finding was that the conversion analysis successfully forecast the business impact of specific customer experience factors. Machine learning in general can thus be used by a design agency before formulating the design brief, and before making investment decisions on design projects. Since the feeling of caring was a solid basis for focusing the Double Diamond process, the impact of the design outcomes was greater and involved less effort, compared to the demands of starting the research with an open brief. Additionally, complementing a qualitative approach with a quantitative methodology increases the perceived credibility of the design suggestions by top management.

### **Limitations**

It is reasonable to assume that there are numerous attributes that contribute to the customer experience on a personal level, which are not represented in the data we had available for the conversion analysis. Therefore, a different development focus could be identified by adding more variables in the analysis. However, our method is still valid in measuring the relative efficiency of the customer experience factors with respect to each other. For example, it is valid to interpret that improved feeling of caring is estimated to have two times more the NPS conversion compared to improved professional customer service. The absolute, actual conversion estimates should be interpreted critically.

The conversion analysis requires data, which is sometimes unavailable, or costly to acquire. The data has to represent the analysed phenomenon and be relevant for customer experience. Even an infinite amount of data does not provide insight if the data is irrelevant to customer experience. This case was a good example of how machine learning-based analysis can give direction for the design process, but more empathetic understanding and co-design is still needed to transform findings from Diamond Zero into desired actions to improve customer experience and NPS.



## Future work

We are experimenting with many other client cases to discover how machine learning can add value and upscale the designer's work. We do not believe that machine learning will replace a designer in future since humans have a much broader view and knowledge of the world, especially about signals that are not available in given data. Our goal is to create new machine learning-based tools for designers in order to combine empathy-based sense making skills of designers with quantified analysis of data. We hope in the next version of the design process, machine learning becomes an integral part of the actual Double Diamond design process e.g. as per our suggestion "Diamond Zero". However, there are also other ways of integrating machine learning with service design and customer experience, which we will explore and develop. Our goal in this endeavour is to increase the design process efficiency and the impact of its outcome.

Combining design process and machine learning technologies is still a weakly explored territory in academia, and we believe examples from real life are needed to foster meaningful dialogue around this topic between industry and academia. This is an exciting domain for the research community to tackle, with potential for high societal impact. Our future plans include the careful definition of the new "Diamond Zero", where machine learning and service design meet. We will provide multiple examples of "Diamond Zero" in practice where we have utilized various machine learning-based analyses.

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