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Service Design Creating Value for Industrial Corporates through AI Proofs of Concept

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The field of service design has set practices that are useful during servitization transformations intended to help businesses respond to customers' rising expectations regarding the value of the service experience itself. As businesses increasingly pursue service development alongside product development, they need new ways of working and of evaluating solutions. Simultaneously, technological advances open avenues to new services and ways of interacting with customers. This paper draws on two workshop case studies of artificial intelligence (AI) assistant projects to examine service design in the industrial context. Through these case studies, the paper illustrates how proof of concept (PoC) is used at different project stages and explores how service design can support creation of PoCs in large industrial corporate contexts. The findings reveal the aspects of PoC as embodied experiencing of intangible AI concepts, the creation of PoCs through conversations, and the role of PoCs in industrial service design process.

Keywords: industrial service design, proof of concept, AI assistants, embodiment, corporate context

Introduction

Service design plays an ever-increasing role in industrial corporate contexts. This paper explores how service design can add value by creating proofs of concept (PoCs). A PoC is 'evidence, typically deriving from an experiment or pilot project, which demonstrates that a design concept, business proposal, etc. is feasible'.[1] As a way of concretising early-stage ideas, PoCs play an important role in the industrial service design process, helping to communicate the intangible value of service concepts. This paper asks how service design contributes to creating PoCs in industrial corporate contexts.

Service design has become increasingly important in industries that previously focused on manufacturing, reflecting the long-term trend of economies that focus on the exchange of services beyond exchange of physical goods (Vargo & Lusch, 2004, 10). This shift affects companies' production, strategies and structures, and many organizations have begun to expand their businesses by offering product-related services and gaining increasing revenues from service business (Lightfoot, Baines & Smart, 2013). For companies engaged in such change, service design introduces design thinking and processes to the development processes, products and services of the company as well as to the company's employees. The use of design has evolved in industrial contexts beyond actual product or service design to become one of the skills required for multi-professional innovation and for running a service business. The role of design is important in contributing

[1] https://en.oxforddictionaries.com/definition/proof_of_concept

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facilitatory methods that enable teams to use creative confidence and expertise when creating new service-driven solutions.

With advances in 'servitization' (e.g. Lay, 2014) and 'servitizing' (Gray, 2013), companies must transition to delivering services successfully through product-service systems (PSS; e.g. Guidat et al., 2014). Creating valuable offerings within this context requires organizations to change their business models, processes and procedures as well as shifting the mind set of their employees and the nature of their relationships with customers and suppliers (Roy & Baxter, 2009) towards service-oriented innovation. Service design practices support and co-create this change; the service designer must synthesize solutions based on comparison of different needs, points of view and socio-cultural models (Morelli, 2003).

The concurrent development areas of service design are often complex and abstract, even in industrial contexts where services are connected to a physical product. It can be challenging to track and quantify services that are experienced subjectively (e.g. Meyer & Schwager, 2007), and methods of understanding user experiences in non-numeric ways can support the development and evaluation of service offerings. The availability of many competing services means that customers increasingly expect both high-quality content and interaction and around-the-clock convenient service access. Digital service channels allow companies to continuously serve customers, and advances in technologies like artificial intelligence (AI) make it possible to engage users in conversation with no actual human involvement on the service provider side. The intangible nature of AI-enabled conversational service interfaces, such as AI assistants, requires service value creation to take on new forms. Service design methods used for concretizing and making it possible to experience such intangible solutions are important means for developing concepts for new technologically enabled services that can be tested and evaluated.

As industry's use of service design increases, new ways of understanding the design process are needed to support implementation and maintenance of services in different organizational departments. One of the challenges relates to how newly generated ideas, concepts and solutions can be communicated, shared and implemented more efficiently and transparently in large, multinational and department-focused companies. One way of supporting service design in such contexts is the execution and use of PoCs. PoCs can be used in different phases of the service design process, from ideation to testing, to demonstrate the value of a product or service (Rauth et al. 2014).

The remainder of this paper is organized as follows. First, the paper presents an overview of the current state of service design work in large industrial corporations. Then, the paper introduces findings from two workshop case studies that consider the creation of PoCs in AI assistant design projects. By focusing on service design methods, the paper discusses the two case studies as examples of how PoCs have been used at different stages of the industrial service design process. The first workshop case study illustrates how embodiment and drama may be used to develop a PoC AI that is intended to create a new type of customer-AI interaction. Specifically, the case study explores voice interaction and conversational interface as a means of proving a concept's viability. The second workshop case study also utilizes AI as a base technology: a PoC of a chatbot is tested via involvement of potential users. Three main topics emerge from the analysis of these two workshop case studies and are presented in the findings: embodiment in experiencing the intangibility of AI assistants, service value through conversations, and PoCs in the industrial service design process. The paper concludes with lessons learned from the case studies and reflects them to define the role of service design in industrial contexts.

Service Design in Industry

Industrial service design refers to service design practiced in an industrial context, often inside an organization. According to Miettinen (2016), 'industrial service design is embedded in existing corporate structures and processes', where the service designer negotiates and initiates service design within the frame and constraints set by the organization. Industrial service design supports transformation towards more agile working methods and an iterative process for service development, enabling the organization to meet increasing demands from customers and the service market. To enable this, service design thinking must be a cross-cutting process that supports lowering of silos and flattening of hierarchies.

Beyond the traditional 'double diamond' model of the design process, Miettinen (2016) identified the following steps in the industrial service design process: (1) the pre-process, including strategic thinking and internal marketing; (2) running pilots with the team; and (3) scaling up the service solution. Service design in

the industrial context must be highly adaptable to find its way into the everyday practices and processes of existing design and innovation teams. The adaptation of service design in an organization is needed to support human-centred thinking and the creation of customer-oriented service journeys.

In industrial contexts, the service design process rarely begins from a predefined brief; rather, it typically involves a process of strategic thinking and collaboration within the organization, culminating in a project description. Before a project gets underway, it must be aligned with internal stakeholders and decision makers. This commonly involves presenting the project's goals and objectives, as well as outlining the resources required, to groups of stakeholders before a decision is made to proceed with the project. For this purpose, it is also helpful to be able to demonstrate that the project has business potential and can address real needs.

In seeking project approval, service designers often initiate PoCs or pilots to demonstrate the viability and feasibility of a topic, idea or concept. During piloting, it is important to refer to the original strategic alignment and planning to ensure that the project is moving in the right direction. The scope of a pilot or PoC can vary: PoCs are often small-scale or short-term efforts that enable the team to assess certain features of the project, while a pilot often follows more detailed concept development. Pilots are usually a test phase involving a limited number of users and often a limited set of service features. PoCs and pilots enable the team to identify both limitations and opportunities for development and support refinement before scaling up to a public customer solution.

Depending on the organization, scaling up may include internal processes such as IT development and data security. For the service designer, it is important to know the required steps inside the organization in order to successfully scale the service and launch it for customers and responsible business units. Beyond individual services, the challenge is often to see the big picture of individual service actions as a sequence of touchpoints that may seem disconnected from an industry perspective but make more sense as a single process for the customer. According to Miettinen (2016), a 'sequence of well-designed actions constructs a unified service experience', and a customer experience framework can be used to develop services and touchpoints within a unified service system.

AI Assistants

AI has been in development since the 1950s, but advances in AI in the past decade have made it more visible to the general public. While AI still exhibits a rather narrow definition of intelligence, it has proven valuable in the field of digital services. AI streamlines the analysis of large amounts of data and provides new ways for humans and machines to interact, such as AI assistants.

An AI assistant is a virtual system that utilizes AI technology to understand a customer's request based on written or spoken words. The assistant can also function as a service interface (Shevat, 2017) to support users in everyday tasks (Jolley, 2016; Afshar, 2017). The technology underlying AI is used to understand human behaviour and needs, and to allow the AI assistant to communicate responses back to users via conversations using natural language. As AI assistants such as Siri from Apple and Alexa from Amazon have begun to infiltrate the market in recent years, brand and service interaction is transitioning from touch-based interactions with applications towards conversational interaction (Gartner, 2016).

An AI assistant can take many forms and play many roles in delivery of a digital service. Frontend services can be facilitated through an AI assistant interface that is in direct contact with users, simplifying user tasks such as getting info on your next trip[2], ordering items[3] or organizing meetings[4]. In other cases, an AI assistant can be a backend resource, for example by assisting a human service agent in accessing relevant information, carrying out rapid analysis or giving suggestions on service actions based on accessible data (Gartner, 2019).

Regardless of the role, each type of AI assistant has a clearly defined purpose with regard to how it contributes value to a service. To achieve its purpose, an AI assistant requires a certain level of intelligence and ability that allows it to understand the user's need and respond to that need accordingly. Creating an AI assistant involves multiple aspects beyond the technology. An AI assistant commonly comprises selected service functions, the

[2] Many travel agencies such as Expedia and airlines like KLM have a chatbot for providing travel information to their customers.
[3] For example, Amazon Alexa.
[4] For example, x.ai (https://x.ai).

information provided or collected, frontend customer interface(s) including voice, text and visuals, and the assistant's character as well as the required technology and intelligence in the backend. As an AI assistant is likely to be seen as the voice of a brand, it is important to consider what expectations and meanings it creates for the brand. In other words, an AI assistant's character and behaviour are likely to influence how the brand is seen by customers.

Designing the assistant's character includes defining its personality, behaviour, appearance and tone of voice. In many cases, the assistant is also given a name and a backstory that defines who it is and how it behaves. All the designed aspects of an AI assistant are eventually communicated to users primarily through conversations. Compared to other digital service interfaces, such as websites, apps or display screens, an AI assistant relies primarily on spoken or written language.

Research methods and data

The research data come from two workshop case studies and includes images, field notes and documented personal reflections of the authors as service designers in the workshops. Both of the workshops were held with one large international organization but each had a different focus in terms of purpose, process, outcomes and people involved. The workshops were facilitated by service designers; Case Study 1 was run by internal service designers, while Case Study 2 included external service design support.

Table 1: Description of workshop case studies

	Case Study 1	*Case Study 2*
Focus	Future-oriented concept for AI assistant	AI assistant for customer service using a chatbot
Workshop description	1 day 12 participants Internal	1 day 6 users External
Workshop aim	Ideation and development of a concept	Testing of initial version of AI assistant with potential customers
Key methods	Personas Future visioning Role-play	Usability testing
Purpose of PoC	To prove the potential of new business areas	To prove user acceptance and to collect feedback for further development

- Case Study 1 focused on the creation of a future-oriented concept for an AI assistant. The workshop was constructed around a common view of a service landscape and future scenarios in order to explore the boundaries and possibilities of solutions that the case organization might offer to their customers. The content of the envisaged solution was created through customer journey enactment and mapping.
- Case Study 2 was a customer workshop held as part of a project to develop an AI assistant. Six potential customers were invited to participate in the workshop to test the initial concept by exploring content areas covered by the assistant and trying out the conversation interface. The workshop was an important step in proving that the concept could meet customer expectations so that a finished product could be developed.

As this paper's primary concern is to analyse workshop processes in order to study the constructs that constitute a proof of concept in an industrial service design context and AI-enabled services, further detail about the content and topics of the projects is not of immediate relevance. This also preserves the confidentiality of the workshop content and outcomes. The following three sections describe the findings

emerging from analysis of the workshop case studies and discuss the roles and aims of the PoCs in each workshop.

Findings

Embodiment in experiencing the intangibility of AI assistants

The goal of the first workshop was to better understand users in future service settings where an AI personal assistant can enable new types of services. The workshop initially adopted an ecosystem perspective to develop a common vision of the scope of service opportunities the company might seize within the projected timeframe. Based on three future scenarios, this service ecosystem (Banoun et al., 2016) was used to frame ideation of the assistant and the customer services it might offer. Common methods of enhancing the exploration of possibilities for service interactions include experience prototyping (e.g. Buchenau & Fulton Suri, 2000; Rontti, 2016), role-playing (e.g. Iacucci, Kuutti, & Ranta, 2000), bodystorming (e.g. Oulasvirta et al., 2002) and service prototyping (e.g. Blomkvist, 2014; Rontti et al., 2012; Miettinen et al., 2012).

The method of role-play was used in the workshop in combination with pre-defined persona profiles (Blomqwist, 2002). The characteristics of the personas guided the workshop participants to take on roles as users in the role-play and explore through embodiment the actions and reactions the user might have in the future service situation. As a starting point for ideation, participants listed possible tasks that the persona might undertake in their everyday life. The tasks were then taken into the SINCO (Service Innovation Corner) service stage (Miettinen, Kuure, Rontti, & Lindström, 2012), using digital backgrounds, sounds and physical props to set a scene for a service situation. While situations from the customer journey were acted out, one participant would adopt the role of the AI assistant and would be visible to the 'customer' only through its voice and selected visual cues. The insights and ideas developed through this enactment were collected and used to generate a user journey map (Temkin, 2010) showing possible user actions, the function of each service, and the interaction between the user and the AI assistant.

Embodied design methods were instrumental in understanding the interactions and proving the value of the service from a customer perspective. Technologies people use in their everyday activities fundamentally shape how those activities might be done, and it is thus critical for designers and participants to understand those practices (Robertson & Simonsen, 2012). Although the workshop was internal to the development team and actual potential users were not involved, the enactment of service situations enabled the participants to adopt the user's point of view and thus experience the service situations from the user's perspective. Role-playing is widely recognized as a powerful method for observing and discovering aspects and elements of service (Buchenau & Fulton Suri, 2000). However, empathizing with someone else's role differs from using experience prototyping to experience the service subjectively for oneself (Miettinen et al., 2012). Previous studies have also confirmed that it is beneficial to involve company representatives directly in acting out new service concepts. This deepens their insight into the new idea and into the user experience, enabling them to evaluate the service experience from the user's point of view rather than as an outsider.

In AI assistant services where service content may only be expressed through language, it becomes crucial to involve the user in the design and development process. Creating a PoC for the assistant is one way to collect relevant user feedback to enable an incremental and iterative design and development process. As an element of service delivery, an AI assistant is likely to appear somewhat abstract, and without a concrete embodiment of the solution, it may be difficult to convey what it might be like to interact with such a service entity. In this case, the embodied service situations can be considered as proofs of concept. The workshop focused on potential services five or more years in the future based on assumptions of certain improvements in AI technology. Therefore, participants also had the freedom to imagine interactions that current technology might not yet support. Because the technology does not yet exist, it was considered more efficient to first prototype and evaluate the interaction through human-to-human role-play. This kind of exploration leaves space for improvisation and new findings, which human-centred service design encourages (Penin & Tonkinwise, 2009).

Service Value through Conversations

The second workshop was part of the process of designing an AI assistant for customer service support. The overall process followed the steps of use case definition for the assistant and design of the assistant's

personality. The use cases were transformed into conversation flows in a website chat window that used the final technology but did not include the final user interface (UI) design. Six potential users were invited to the workshop to test the initial version of the assistant and to offer feedback to inform future development. The test version of the assistant included AI skills for natural language understanding and processing, enabling the assistant to understand the user's needs and match those needs to defined responses or specific conversation flows. Six different use cases were included in the conversation content that underwent usability testing.

The aim of the workshop was to evaluate the service value an AI assistant can bring to users in the form of language. Character design elements, such as personality and traits, were included in the proof of concept along with the conversation content. The participants were asked to provide feedback on how they perceived the assistant's appearance and personality—for example, its level of politeness and use of words—and the value of the content it provides. Using laptops, participants tested the assistant on a test website through a chat window. Before starting the interaction with the assistant, a service scenario with a specific user goal was explained to the participants; they were then asked to start a text chat conversation with the assistant in whatever way they considered appropriate to the situation. The conversations were logged, and later in the workshop, the conversations were analysed and discussed together with the participants.

Providing service content purely through machine-generated conversation is still a rather new format for service providers. In order to test and evaluate the value of such service content, a PoC with the actual technology provided a means of communicating the content to users and receiving their feedback. The tests revealed the limitations in the content and conversation flows but also confirmed customers' willingness to interact with an AI assistant when it offers them concrete value. This might include simplifying a service process, taking over tasks that would otherwise require more effort on the part of the customer or providing easy access to information that might not otherwise be available to the customer.

PoCs in the Industrial Service Design Process

PoCs can serve multiple purposes in the service design process. In the first case study, a PoC was used as a form of ideation together with embodied design methods; it was also used to provide evidence of the intangible value of the AI assistant. The workshop was located in the discovery phase of the service design process and was used to collect more information about the possibilities of a service area that could be covered by an AI assistant in the defined future setting. As the workshop was also intended to communicate the potential value of the project to internal stakeholders, it can be also connected to the 'pre-process phase of strategic thinking and internal marketing' identified by Miettinen (2016) as one of the characteristic steps of the industrial service design process.

PoCs can support internal team communication. Design activities involve not just thinking or pure creativity but also communicating what design is or what it could be in ways that are understandable to others (Knight, 2012). Industrial service design supports understanding user actions and technologies in actual settings collaboratively and pragmatically rather than through abstractions. This supports mutual learning (Kuure & Miettinen, 2013) and idea sharing. Through improvisation and spontaneity, service design can work as 'communicative activities in ordinary conversation inside the organisations´ (Larsen & Friis, 2005). In the workshops, the use of PoCs that could be experienced allowed the participants to work from the same page, enabling easier, faster team work. After the workshop, the PoCs were also used in internal communication in the company to help other stakeholders understand the aims of the project and to generate the support needed to gain management approval to continue the project.

PoCs are often used as fast, efficient small-scale tests. They do not need to be publicized but can remain internal to the organization and can be used to further define the future direction of service development. Therefore, they are also useful prior to larger scale pilots that require the service to be in a close-to-finished state and that require a larger group of users involved in the testing. Running pilots is one of the characteristics of industrial service design processes (Miettinen, 2016), and this is where the second workshop case study can be located.

When the service is delivered through a conversational interface with an AI, the ability to experience the PoC is important in understanding how the service answers the needs of the user, how the value is created and delivered, and how the interaction fits as a service action with the larger view of the service journey the organization provides to their customers. An AI assistant can be seen as a single service touchpoint that complements the other steps in the service journey. By keeping in mind the larger picture, including the

connections to other service actions, throughout the service design process, designers can ensure that the AI assistant has an established and verified place in the service offered to the customer.

Discussion

The workshop case studies show that PoCs serve different purposes at different stages of the industrial service design process, allowing the investigation, for instance, of customer needs, business potential, technical feasibility or the match between content and user expectations. Among the benefits of using a PoC in this context is that it provides early feedback from users or internal stakeholders about whether the project is going in the right direction. A PoC also makes the design target more concrete by giving it a functional form, whether through role-play or using the actual technology; such concretization enables stakeholders to discuss and evaluate the idea, concept, vision or strategy that the PoC represents. The case studies and the use of service design to illustrate these features in PoCs are a valuable contribution to industrial service design research (Miettinen, 2016). Further, including PoCs in the service design process adds value to experience prototyping (Buchenau & Fulton Suri, 2000).

Clearly, design PoCs also have some limitations. As they often demonstrate only one part of a wider solution, it is arguable whether a design PoC provides a sufficient basis for decision making. One PoC alone may not prove the case for an entire project, making it crucial to understand how and why the PoC is created in the first place. Especially in industrial contexts, winning the support of partners and internal sponsors is crucial for project continuity (Miettinen, 2016). To secure support for a project, it is essential to know what speaks to the relevant audience.

Depending on the decision makers and the design process stage, the focus of PoCs must be adjusted to acquire the insights needed at that particular step in the design process. At the outset, customer feedback on the initial idea may be the most worthwhile first step; PoCs with preliminary UI ideas can help to trigger customer comments and feedback. At the development stage, a technical PoC integrating a ‘click dummy’ prototype may offer more insights for addressing development backlogs. In many cases, a PoC is also used simply to assess the adaptability of existing technologies or service solutions to the concept.

Use of a PoC in industrial service design is an iterative process, and several PoCs may be needed before reaching a final concept and implementing the solution. Ultimately, based on the project stage, the project team must define the aim of the PoC, how it should be built to achieve that aim and how success of the results will be measured. As noted above, creating PoCs can be a crucial step in ensuring project continuity as it can provide concrete proof of areas of opportunity. Nevertheless, a PoC may not be comprehensive in itself, and combining it with other forms of insight such as customer testing, market research or business analysis can provide the information needed for decision making in relation to project direction and further development.

A variety of skills are needed to develop PoCs appropriate to the project stage. In addition to service design skills, technical expertise is necessary to create PoCs of the requisite quality, especially for digital service channels. A good sense of what is technically possible and the best means of achieving project goals with the available tools and skills is also important. What can reasonably be tested, what form of PoC best fits the project stage, and how to connect the process of creating a PoC to the existing organizational processes should be determined through collaboration and discussion among the project-owning business unit, service designers and technical experts.

Conclusions

Proofs of concept play an important role in AI assistant design projects, as they allow evaluating, testing and communicating the value of services. Service design supports the creation of design PoCs by incorporating the views of different stakeholders into clear goals through concretization and visualization and by facilitating collaboration among involved teams and experts. By introducing service design methods for ideation, prototyping and testing, insights and learnings from PoCs can help designers articulate concrete opportunity areas, development requirements or action plans for a project’s next steps.

Depending on the intended purpose, a PoC may be more technical; in such cases, the role of service design is to keep the customer viewpoint in mind, avoiding technology-first development that risks developing solutions with no clear usability target. The strengths of service design include an understanding of customer needs and

expectations, and the ability to utilize that knowledge to evaluate PoC outcomes plays an important role in clarifying insights and incorporating them into the project's next iteration.

Drawing on two examples of the use of PoCs in AI assistant projects, this paper illustrates how the purpose of a PoC can vary according to the project stage and goals. There is a tradition of utilizing PoCs in fields such as business and IT development; in industrial contexts, where projects are often interdisciplinary, it may likewise be useful to have a tool that has a common meaning for everyone. At the same time, the tool can be used in different ways, and service design can open new opportunities by introducing methodologies such as embodiment to deliver concrete and meaningful outcomes without significant investments of time and money.

As the data set of the paper is limited to two case studies, further research is needed to show the full potential of using PoCs in the design of AI-enabled services in industrial contexts. However, the research shows the value of AI PoCs in the discovery, ideation and testing phases of AI assistant projects. PoCs can concretize intangible AIs and allow users and stakeholders to better understand the meaning of conversational service delivery. They can also point the way to further development directions for the solution. In the future, AI PoCs might also support earlier and more direct involvement of users in industrial service design projects through digital channels, thus overcoming the organizational boundaries that typically exist today.

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