Design Knowledge for the Lifecycle Management of Conversational Agents

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Abstract. Organizations spend extensive resources on artificial intelligence (AI) solutions in customer service in order to remain customer-focused and competitive. A rising language-based application of AI emerges in the context of conversational agents (CAs), such as chatbots, which represent increasingly intelligent, autonomous, scalable, and cost-effective service platforms. However, AI-based CAs bring new organizational challenges. They are underrepresented in current research, leading to many unanswered questions and research potential regarding the management of their introduction, operation, and improvement. To address this issue, we provide design knowledge that considers the organizational perspective of CAs. Therefore, we conducted a systematic literature review (SLR) and qualitative interview study to reveal and analyze individual issues and challenges, develop meta-requirements, and finally, use them to create design principles. We contribute to the emerging field of CAs that has previously focused mainly on the individual, behavioral, interactional, or technical design.

Keywords: AI-based assistants, conversational agents, chatbots, design principles, interview study

1 Introduction

Organizations invest extensive resources in customer service in order to remain customer-focused and competitive [1]. Customer service is important in determining critical service outcomes such as satisfaction and loyalty [2, 3]. However, technological advancements and the growth of information are reshaping the work of service employees [4]. Prevailing challenges include a high volume and complexity of inquiries and rising customer expectations regarding service quality [1, 5]. Consequently, service employees face high-stress situations, ultimately inferior service quality [4].

Advances in natural language processing (NLP), machine learning (ML), and general AI have spurred service innovations and promote possibilities for designing intelligent, human-machine user interfaces (UI) [6, 7]. CAs represent one specific application of AI: communicating with customers via natural language commands [8]. Typical examples include chatbots in messaging applications, such as in MS Teams [9]. CAs are scalable and cost-effective, bearing the potential to automate, augment, and assist service interactions by identifying solution strategies and providing decision-making and problem-solving support [4, 6, 7]. They can assist employees in service

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encounters with cognitive relief by facilitating the performance of specific tasks [10, 11]. Further, CAs are convenient channels for customers [12, 13]. Customers are expected to resolve issues themselves via this novel UI before reaching out to customer service employees [14]. However, despite an increasing interest from researchers and practitioners regarding the potential of CAs in service encounters and workplaces—evident by new research studies [15]—many CAs fall short of expectations [7]. Furthermore, organizational adoption of CAs lags behind consumer usage [1, 8, 16]. CAs represent a novel subtype of AI-based information system (IS) with distinct characteristics [17], such as being autonomous social actors [18], while learning and being intelligent [17]. Their successful adoption depends on organizational arrangements, including collaborative and continuous training and development approaches involving efforts by IT, business, and service professionals [11]. Further, CAs demand novel employee- and data-focused management approaches [11].

In this context, extant research into CAs is primarily focused on individual (e.g., trust issues), conceptual (e.g., interaction design), or technical design aspects (e.g., NLP algorithms) [15, 19-22]. Conversely, less is known regarding the management of CA applications in organizational contexts [1, 10] and studies investigating CA applications often ignore their long-term success [1, 23]. Closely related to this, research regarding the strategic management of CAs' introduction, operation, and improvement is scarce [10, 11]. However, the successful introduction and management of CAs depends on clear operation and maintenance processes, and diligences [24]. Guidance in integrating CAs in existing organizational processes, governance structures, and work routines as well as how their adoption differs from other AI-based and conventional IS is limited [11]. First authors call for research on how organizations can most effectively implement/deploy [15, 25], adopt [26], and manage [1, 10] and maintain CAs [24]. While existing studies reveal initial issues and factors that influence the successful adoption of AI-based systems (e.g., [27, 28]) and CAs (e.g., [1, 10, 25]), research does not yet provide procedural guidance regarding the organizational rollout and continuous improvement of CAs across their lifecycle. Thereby, an understanding of CAs' lifecycle management (LCM) can provide a structured, unified view of this dynamic and novel IS, and link resources in order to ensure a reliable, consistent, and cost-effective handling of planned and unplanned changes based on previous issues [29]. Based on this research gap, we formulate the following guiding research question (RQ):

RQ: *How to manage the lifecycle of conversational agents?*

We address this RQ by first developing prescriptive and supportive design knowledge following the process of [30, 31] to manage CAs' lifecycle. Drawing upon the results of an SLR, we conduct an empirical interview study to identify issues regarding the implementation, adoption, and LCM of CAs. Based on these issues, we define meta-requirements and derive design principles (DPs) under consideration of the work system lifecycle model (WSLC) of [29] as a supportive design frame. This article is structured as follows: Section 2 outlines the research background on LCM and customer service CAs. In Section 3, we present our research methodology. Subsequently, in Section 4, we present the findings of our study, including an overview of issues, meta-requirements, and the DPs. Finally, we discuss our findings in Section 5, and conclude with a summary of our limitations and contributions in Section 6.

2 Research Background

2.1 Lifecycle Management

In scholarship, several models exist for LCM, such as the work system LCM, IS LCM, or software/product LCM [29, 32]. Thereby, it is often unclear which models pertain to which topic and how the proposed phases vary [32, 33]. Nonetheless, LCM models elicit a shared consensus, and usually includes a phase-based/iterative view of systems to understand issues that occurred in the past to guide a more successful course for the future [32]. LCM models often rely on a broad view that integrates organizational (e.g., the change process), management-driven (e.g., view on the process, participants, and information), innovation-driven, and technical views, and thus provides a holistic view of socio-technical systems [29, 32] and promoting, e.g., system thinking [34, 35].

LCM models originate from the field of software engineering (e.g., system development lifecycle [32]) and usually comprise a process from requirements analysis to the maintenance of IS [33]. In this context, [33] have compared software and service LCM approaches from practice and academics. They found that software LCM models predominantly have parts of the "Plan/Analysis," "Requirements definition," "Design," "Development," "Test/Deployment," "Run/Operation," and "Improvement" phases.

However, software LCM approaches are strongly technology- and development process-focused and often de-emphasize management-oriented viewpoints as the initiation, preparation, implementation, and change in an organization [32]. In this context, one specific LCM framework—*"encouraging a balanced view that includes the organizational and technological viewpoints"* [32, p. 3]—is the WSLC of [29]. The WSLC is based on the work system framework and is comprised of the phases of initiation, development, implementation, and operation/maintenance [32]. We build our study upon this model as it encompasses most existing LCM models for IS, processes and projects [32], and provides within its iterative and adaptive frame a more holistic view on an IS lifecycle in organizations, with consideration for several influences on IS. In this context, the WSLC provides a good analysis and design frame [36] for the step-by-step management of CAs as novel form of AI-based IS in organizations, since their management raises many issues and no approaches exist guiding practitioners on how to manage this class of IS in their lifecycle [11]. Further, CAs need an integrated, collaborative, socio-technical, and interdisciplinary view [11] instead of a *"system-as-technical artifact perspective"* [29, p. 74], as the WSLC model also embraced [29].

2.2 CAs in Customer Service

Customer service encounters represent the prevalent channel used in service-oriented business models [2, 7] to supply information, and provide advice and support between providers and customers [37]. For measuring the performance of the customer service provider, service quality is an important concept [38, 39], defined as the outcome of a comparison between expectations of service and what is perceived to be received [40]. A significant challenge for conventional customer service is improving efficiency and reducing resources without compromising the quality of service [7, 41]. Thereby, customer service is often the most resource-intensive department within an organization [42]. Many service requests are currently handled manually, which is time-consuming and leads to a high error rate, whereby user expectations can often not be fulfilled [43].

In this context, CAs are evolving to become the dominant customer service channel [13], representing a class of IS that is capable of *"interpret[ing] and respond[ing] to statements made by users in ordinary natural language"* [44, p. 1]. As CAs possess the potential to relieve service encounters by automating, augmenting, and assisting service interactions [4, 6], by, e.g., a 24/7 available CA instead of waiting for an email response [13], they generate widespread attention [7]. CAs are increasingly popular in research and practice [19, 45] for their ability to improve service efficiency, experience, and quality [13], and are being labeled as, e.g., chatbots or conversational intelligence in publications [46-48]. While early CAs were limited to defined sets of conversations [46-48], present-day CAs are sufficiently intelligent for application in organizations [49], due to improvements in NLP and ML [46-48]. In current service encounters, CAs are playing an active role, service employees have conventionally performed [7, 50].

Our research focuses on text- and AI-based CAs, often referred to as AI-based chatbots in customer service (e.g., [13]), due to the opportunities to reach many customers via text-based CA. Moreover, we selected the customer service context as it allows us to study the management of CAs in a context in which they currently attract much attention, even though they have been applied for this purpose without scientific guidance in the past [51]. In this context, research on how CAs can be introduced in customer service and its organizations is still scarce [11, 37]. However, CA applications pose various new challenges for organizations [10, 11]. AI-based CAs represent a novel type of IS [19] by, e.g., being social, unfinished, and learning [11], and therefore, they demand new approaches and research regarding their implementation and LCM [1, 10, 11]. While current technical limitations could be resolved thanks to ongoing technological advances, the lack of knowledge related to organizational design aspects represents an issue needing investigation [1, 10].

3 Research Methodology

3.1 Goal and Study Design to Derive Design Knowledge

This article aims to provide design knowledge that helps organizations manage CAs' lifecycles, presented in the form of issues, requirements, and DPs. The DPs originate from (1) an SLR, and (2) a qualitative interview study with 17 experts on CAs in customer service. (1) The SLR followed the five-step process by [52], which we conducted in the preliminary of this study [11]. It revealed several issues from the nascent CA literature that impacts the adoption, and management of CAs as opposed to general AI-based and traditional IS applications [11]. (2) Based on these findings, we conducted semi-structured expert interviews according to [53-55], which allow a more detailed investigation. The SLR and interview study provided the basis for developing consolidated meta-requirements used to derive DPs. In the following, we present the steps of the empirical research procedure and the steps to derive the DPs in detail.

3.2 Data Collection and Analysis

To gather qualitative data about issues and meta-requirements regarding the CA lifecycle, we started with a preparation consisting of two steps. First, we developed a semi-structured interview guide to ensure a systematic procedure and comparably gathered data [55]. The interview questions were formulated based on a preliminary *theoretical reasoning stage* according to the process of [53], embracing the consideration of the nascent state of the literature identified with the SLR [11], the research gap, and the goals of our study (e.g., expansion of the current body of knowledge on CAs). The participants were asked about the following topics: (1) general experience with CAs and current CA projects (roadmap), reasons/use cases to adopt CAs for customer service (initial situation); (2) general prerequisites for an organization to introduce CAs; (3) challenges in their application (e.g., development and training), use, and acceptance; (4) requirements for a successful application and management; and (5) challenges, requirements, and steps for a continuous improvement process (e.g., activities, tools, and stakeholders/actors that need to be involved).

Second, we determine potential interview partners for the study, intending to understand the application, and management of CAs in customer service. Therefore, we consider several practitioners from diverse areas as *experts* (according to [55]), such as executives, product owners, AI/ML/CA experts, and consultants with professional experience and different *contextual knowledge* [55] in the course of CA projects. We acquired the experts across a dual-stage process. First, we selected experts from our CA research project in customer service. Second, we have access to a broad corporate network of practitioners covering many industries (e.g., banking, consumer goods, e-commerce, transport, manufacturing) from which we have requested and selected CA experts according to the criteria mentioned above. We conducted 20 interviews with 17 experts (see **Table 1**) that lasted between 24 and 67 minutes (mean = 49.95 minutes).

Table 1. Overview of interview study participants

No.	Role	Duration (h)	No.	Role	Duration (h)
01	Project Manager AI/ML	0:56	05(+04)	CA Trainer & Consultant	1:02
02	Manager - AI Innovation	0:52	09(+04)	Consultant & AI Software Developer	1:07
03-06	IT Service Delivery Team	1:01	10	Chief Marketing Officer CA Supplier	0:38
07	Software Project Manager	0:57	11	Team Member in a CA project	0:24
08	Technical CA Consultant	0:53	12	AI Supervisor (CA implementation)	1:03
04	Consultant	1:05	13	Application Integration Professional	0:38
01	Project Manager AI/ML	1:01	14	Product Owner in a CA project	0:50
04	Consultant	0:52	15	Product Owner in a CA project	0:27
04	Consultant	0:55	16	Technical Consultant	0:35
05(+04)	CA Trainer & Consultant	0:55	17	Customer Success Manager	0:28

The interviews were conducted via conference systems, and recorded and transcribed for data analysis until we could not generate any further insights, according to the theoretical saturation by [56]. For the data extraction and analysis, we followed the instructions of [57, 58]. We conducted a qualitative content analysis using *MAXQDA software*. According to the *intercoder reliability check,* two independent researchers continuously compared and adapted an initial set of codes (issues) to ensure the validity of the results [57]. Afterward, based on the coded material, we identified 57 initial mutual issues, which were discussed and clustered with three researchers into 13 issues to help derive meta-requirements and, subsequently, DPs.

3.3 Design Principle Generation

A DP can be described as a *"fundamental rule [...] [derived from] extensive experience and/or empirical evidence, which provides design process guidance to increase the chance of reaching a successful solution"* [59, p. 2]. Our study adopts guidance of [30, 31], describing the formulation of DPs as an essential pre-step and description of abstract propositions for complex artifacts to allow their validated design. Thereby, rigorously formulated DPs can organize the designing of IS artifacts from a higher "meta-level" and, thus, help and improve, e.g., IS development, application, and management processes [30, 31, 60, 61]. The DPs are often derived based on prior knowledge from literature and statements from experts or observations [31]. The term follows a dual nature, since DPs can, e.g., guide a process of designing an artifact or describe software functionalities [30]. Our study derives DPs to generate prescriptive design knowledge that is *"intended to be manifested or encapsulated in an artifact, method, [or]process"* [60, p. 17] (here: denoted as a first approach) to manage CAs' lifecycle. Following the development taxonomy of [30], we developed (1) supportive DPs from (2) a qualitative study (3) to identify issues from the current literature, and then coded and analyzed the interview study (4) in order to derive meta-requirements (Section **4.1**) (5) to formulate DPs in the next step (Section **4.2**) (6) based on the formulation template of [31]. In this regard, a DP serves a precise goal, context, and mechanism and is grounded in its derivation by the relationships among DP elements [31]. Thereby, we followed the first six process steps of [30] for DP Development.

4 Results

4.1 Issues und Meta-Requirements

We identified 13 issues (**I**) and formulated 9 meta-requirements (**MR**) (see **Table 2**). Issue $\mathbf{I_1}$ refers to a missing committed long-term vision and roadmap and, thus, a lack of addressing a clear-cut, valuable, and scalable business problem, resources, and (management) support. Experts stated that CA development often runs *"parallel to day-to-day business and the biggest challenges are more organizational than technical"* (*E_2*). From the literature, [11] describes the need for a long-term vision and commitment. [10, 62] addresses the missing agenda and underestimated effort.

$\mathbf{I_2}$ deals with insufficient knowledge, wrong expectations, and missing acceptance of the CA as novel IS, e.g., due to the new UI. The experts stated: *"we did just go live to test how [the CA] resonates, but people just used it as a search engine"* (*E_3*) or *"the introduction is critical, you have one shot with the CA, or everything is lost"* (*E_7*). E_{17} supports this issue: *"Some [...] overestimate CAs - Once it's set up, the bot works perfectly [...]. That's how they imagine it"* (E_{17}). Similarly, [25, 63] identified these issues *("If a chatbot does not live up to expectations, users get frustrated"* [25, p. 5]) as well as [1, 8, 64]. Based on $\mathbf{I_{1,2}}$, $\mathbf{MR_1}$ emphasizes the provision of a roadmap for org-readiness and vision, including allocating resources (budget, staff), and enabling the organization and customers to understand the capabilities of the CA and minimize adverse effects due to limited understanding, skill level and wrong expectations.

Table 2. Overview of the aggregated issues

ID	Title	Description	Source
I_1	**Long-term vision and roadmap**	The CA deployment does not have a long-term committed vision and roadmap, due to, e.g., a lack of addressing a valuable and scalable business problem, resulting in a lack of resources and support at all levels.	E_{1-5}, $E_{10,13}$, E_{15}, [10, 11, 25, 62]
I_2	**Expectations of novel IS**	The organization has insufficient knowledge, wrong expectations, or lack of acceptance, (employee/user) readiness, and skills when using CAs.	E_{1-5}, E_7, $E_{13,15}$, [1, 20, 25, 64, 65]
I_3	**Release-rush atmosphere**	The preparation effort is underestimated in terms of maturity (quality of data, technology selection, NLP, dialog design, functionality), and CA may thus go live too early, leading to long-term non-use.	E_2, E_{4-8}, [25, 66, 67]
I_4	**Disregard of underlying influences**	When using CAs, legal (incl. IT security, compliance, data protection and data analysis (in the cloud)), ethical issues (e.g., system transparency) and organizational issues (lack of trust and aversion) are underestimated.	$E_{1,2}$, $E_{4,5}$, E_8, [1, 10, 11, 18, 23, 62]
I_5	**Integration and modernization of IT landscape**	On the technical side, CAs are developed detached from real structures (e.g., from existing architectures, and (frontend/backend) systems, data sources) and/or a modernization of the IT architecture is not considered (e.g., provision of APIs).	$E_{1,2}$, $E_{4,5}$, E_8, E_{17} [7, 10, 28, 66, 68]
I_6	**Integration into work structures and processes**	On the business side, the integration of CAs into already existing workflows and business processes is overlooked and CAs are developed detached from existing processes (e.g., feedback cycles and handovers).	E_2, E_4, E_8, E_{10}, E_{17}, [1, 17, 69]
I_7	**Lack of new responsibilities, freedoms**	Further development of a CA requires the continuous involvement of company stakeholders from diverse areas (e.g., works council) as well as creating new roles/freedoms to ensure development efforts (e.g., data, sampling, analysis, training, managing intents, monitoring).	E_2, $E_{11,12}$, E_{16} [10, 11, 19, 24]
I_8	**Underestimation of required competences**	Companies underestimate the required developer expertise, the development of new competence fields (trainers, modelers), e.g., resulting in possible lock-in effects to CA (platform) providers and their frameworks.	E_2, E_{12}, E_{14}, [24, 70, 71]
I_9	**Distributed knowledge in expert domains**	The CA deployment lacks the knowledge of the expert domains in the support for the use case for successful operation; experts do not have the capacity to provide training data in addition to the daily business.	E_{3-5}, E_{7-11}, E_{13-17} [9-11, 24, 72]
I_{10}	**Data availability and NLP-conformity**	CA deployment relates to data management, which is underestimated in terms of accessing and integrating heterogeneous data sources and process these into high-quality NLP-data sets that can be used for training.	E_{4-9}, E_{16} [1, 10, 11, 62]
I_{11}	**Continuous training and maintenance**	The CA does not receive continuous further development and training, although the knowledge, technology, and data would have to be constantly kept up to date, analyzed, trained, and feedback collected to ensure utility.	E_{1-2}, E_4, E_8, $E_{16,17}$ [24]
I_{12}	**Continuous monitoring and visualization**	The CA deployment does not have a continuous monitoring process to demonstrate the behavior and benefits of the deployment to the organization, resulting in missing acceptance and little participation.	E_{2-5}, E_{7-8}, E_{10-12}, E_{14-17}, [1]
I_{13}	**Continuous improvement culture**	The organization has poor feedback and communication culture, which is much needed for the continued development of a CA, as diverse knowledge is needed at different stages of development.	E_{1-2}, E_4, E_5, E_{10-13}, E_{15-17}

Further, we discovered that the preparation effort is underestimated concerning the maturity of the CA. This includes technology selection, data preparation, interaction design, and functionality building. Therefore, the CA may go live too early (e.g., driven by management pressure), leading to the CA's non-usage, and sometimes, a permanent dissent, summarized with **I_3**. Also, several authors underline this issue (e.g., [25] for the right technology selection, interaction design and social cues; [62, 66], the NLP data preparation; [67] for functional maturity). The interview respondents explained, *"[we] have to design [CAs] from diverse perspectives, […] otherwise you can lose the user completely"* (*E_2*) or *"We went early go-live. But the people only thought the CA could not do anything. This led to a lasting low acceptance of the bot"* (*E_4*).

In the context of **I_4**, environmental issues were identified. For CA application, several legal, security, ethical, and organizational issues need to be considered, especially data protection efforts (e.g., [11, 23]) and system transparency (e.g., how the CA works). Experts stated several challenges: *"If someone uses the CA, the chat gets logged, and possibly every conversation could be recorded and analyzed including sensitive information"* (*E_2*) or *"[The CA is] only allowed to communicate about personal data if the user has been authenticated"* (*E_8*). The issues **$I_{2,3,4}$** contributed to **MR_2**, which targets an appropriate CA preparation and ensures that the expectations are met, e.g., by employee training and an appealing, committed CA maturity at rollout.

Per **MR$_3$**, the CA implementation and (further) development needs to consider the involvement of various (perhaps impairing) actors. This requirement results from issues **I$_3$** and **I$_4$**. The missing involvement and underestimation of underpinning parties (e.g., the data protection department or the worker's council) can lead to a non-usage or closure of the CA project before it has fully arrived within the organization.

For **MR$_4$**, **I$_5$** and **I$_6$** were the input. **I$_5$** refers to the fact that CA development happens detached from actual IT structures (e.g., from existing architectures, systems (frontend/backend) and modernization of the IT is not regarded. Experts describe that CA development requires *"complex things outside the core technology, technical integrations with backend systems"* (*E$_{15}$*). An integration of the CA into relevant systems [7, 16] and the handling of data from various systems, to create a seamless orchestration point for customer service should be considered [1].

Further, **I$_6$** addresses the lack of integration into governance, work structures and business processes. The literature emphasizes that for a successful CA application, an integration into current processes is obligatory *("process-aware CAs,"* [1, p. 5823]), including handovers to the service desk or human-in-the-loop concepts [1, 17, 69]. Experts raised several problems: *"We need to get the user to look first at the CA and afterwards at the usual service desk [...], therefore CAs must be integrated in existing processes."* (*E$_3$*) and *"a direct human handover would be nice, if the CA is unable to handle the request."* (*E$_4$*). **I$_5$** and **I$_6$** led to **MR$_4$**, defined as holistic system thinking of technical and organizational integration and renewal options. However, there is a lack of responsibility, roles, and freedoms for ensuring underestimated development efforts get underway (**I$_7$**). The interviewees argued for new roles like a "CA trainer." *E$_2$*: *"We need one full-time person for only training and implementing use-cases."*

I$_8$ addresses the undervalue of the required expertise for CA development, including a lack of time to develop CAs further. CAs' development often disregards novel competencies and responsibilities (e.g., for data preparation, training, monitoring), often leading to "lock-in" effects on CA (platform) providers. In general, CAs tend to work like black-boxes, require new developer expertise [70, 71]. These two issues led to **MR$_5$**. Further, **I$_9$** comprises that the CA deployment disregards the knowledge of the expert domains (e.g., concrete knowledge of use cases, conversations, and processes). In this context, experts cannot provide training data in addition to their daily tasks without relief. Thereby, CAs need training as unfinished IS and depend on knowledge provision [11]. It is crucial to integrate the domain experts into the development process [9, 20, 62]. Experts stated: *"Not every developer has know-how about the processes. The business units need to get continuously involved."* (*E$_4$*) or *"we analyze the chats with the customer service [...]. For example, this wording doesn't fit [...] the conversation flow, [this] needs to be redesigned because it's too complicated"* (*E$_{17}$*). This issue leads to **MR$_6$**, which states that it is necessary to involve domain experts to integrate "real" knowledge, e.g., for functionality/dialog generation and design.

I$_{10}$ illustrates that a CA application does not concern data management activities. CAs' training depends on the access and preparation of many (often heterogeneous, unstructured) data sources that are difficult to integrate and process into high-quality data sets for training activities. Several authors emphasize data availability, preparation, actuality, and NLP-conformity ("creation of a knowledge base") [19, 27, 62, 66].

Similarly, E_4 describe: *"One challenge is the homogenization of the data"* (E_4) and *"several of knowledge data in the different business units, [...] difficult to integrate them for the data processing and keep it up-to-date"* (E_4). The additional effort to train NLP components distinguishes CAs from other AI systems. Consequently, **MR**$_7$ requires to establish activities for data access, assessment, selection, and preparation.

I$_{11}$ addresses a CA does not receive continuous training. However, the data and technology, need to be constantly analyzed (e.g., with chat logs analysis), updated and trained, or otherwise, *"acceptance problems or legal effects could be the consequence"* [10, p. 7]. In addition, feedback needs to be collected to ensure utility and relevance. E_{17} describes, *"CA will quickly get outdated, [...] user questions and the content are changing [...]. Emphasize the topic of continuous improvement, training [...] that's [...] our biggest problem."* (E_{17}). The described issues **I**$_{10\text{-}11}$ contributed to **MR**$_8$.

For **MR**$_9$ the issues **I**$_{12,13}$ influenced. **I**$_{12}$ describes the CA application not to have a continuous monitoring for demonstrating behavior (e.g., chatlog analysis) of the CA to the supported domains (e.g., metrics/dashboards). Expert states *"It's important that there is monitoring to decide which [..] functions run well."* (E_8) or *"the business units [need] to see which knowledge articles are good and which need improvement"* (E_4). Interviewees identified that organizations often have poor feedback and communication culture in CAs' development, lead to **I**$_{13}$. There are diverse knowledge and feedback needs: E_{16} describes, *"we accompany the whole thing with training, feedback [...]. This includes [...] continuous improvement. [It's] not a one-time thing [...], it is permanent. Continuous tasks, [...], training of the bot, quality assurance, monitoring."* (E_{16}).

4.2 Design Principles

Based on the coded text passages, we have identified 13 issues and formulated 9 **MRs,** which were used to derive 7 prescriptive **DPs** to guide and manage CAs' initiation and further development lifecycle. The DP development is outlined in Section 3.3. The **DPs** are depicted in **Figure 1**, including the mapping from issues to **MRs** to **DPs**.

CA Initiation: DP$_1$ aims to guide the initiation and strategic preparation of the introduction to CAs to ensure organizational, and customer readiness, engagement, and long-term commitment regarding this novel IS form (**MR**$_1$ and **MR**$_2$). E_1 states, for example, that not every form of company is suited for a CA application. With readiness ensured, the CA application comprises an extensive and often undervalued initiation process. The CA must address an apparent, scalable business problem and vision, ensuring that the CA is *"more than another proof-of-concept"* (E_4). Formulating a roadmap supports establishing a CA team (**MR**$_5$), and expectations regarding development time to ensure that the CA application gets enough effort. Further, a CA application needs right from the initiation the establishment of a collaborative, and continuous development culture (**DP**$_2$). The consideration of regulatory and ethical issues [13, 73], and expert knowledge need to be modeled in the CA is highly relevant. For example, the team around $E_{4\text{-}6}$ offer specialists (e.g., support employees) a middleware on which they can create knowledge articles and dialog data sets to later train the CA. For later development activity, the involvement of (impairing) stakeholders is indispensable for establishing long-term commitments (**MR**$_{3,6,9}$).

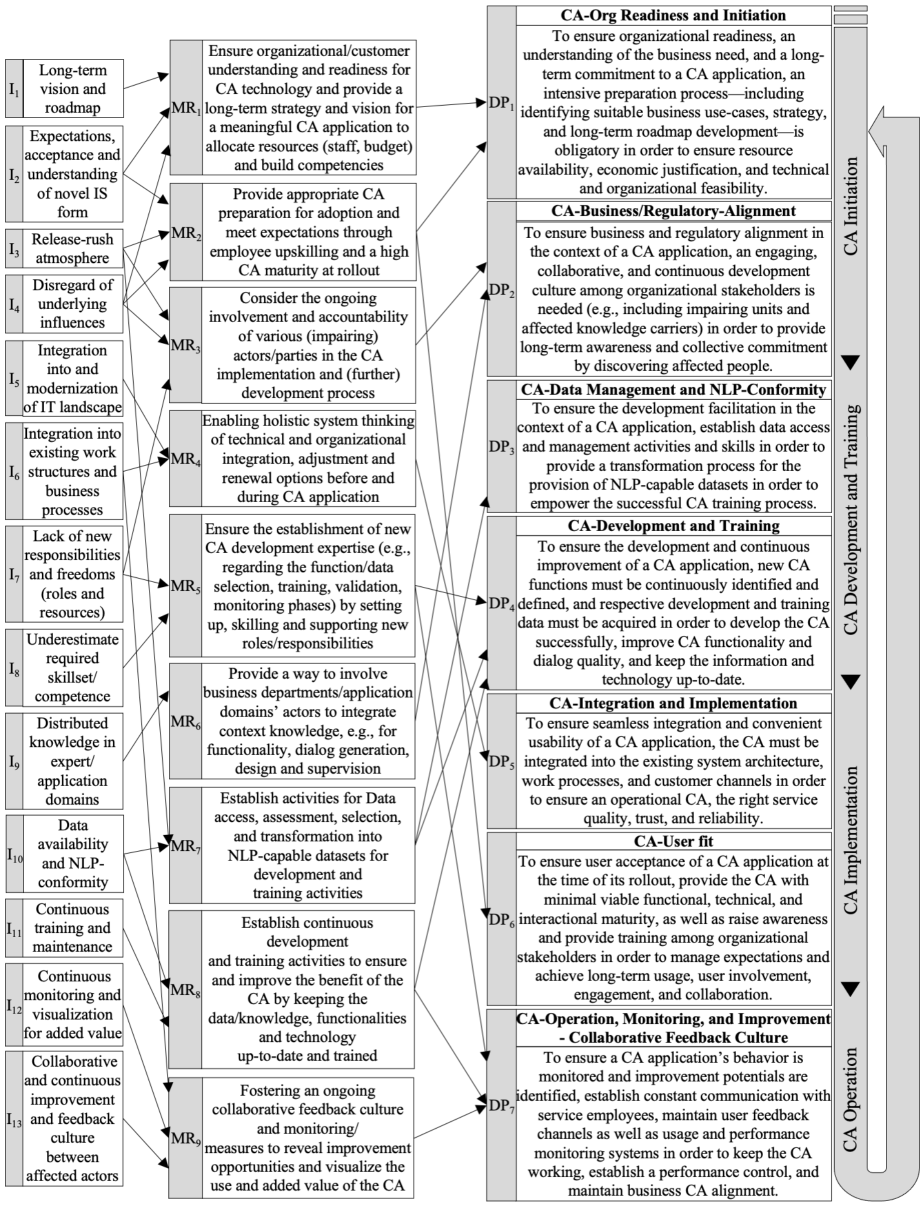

Figure 1. Overview of the derived DPs according to [31] and the design frame of [29]

CA Development and Training: To empower CA development and training activities, a CA application requires practicing of preparatory data management activities to provide/formulate, e.g., NLP-capable datasets, as depicted in **DP₃**. Strongly related is **DP₄**: In addition to **DP₂** (e.g., knowledge carriers), a continuous interplay between CA development, data access, selection, and preparation activities (**DP₃**) is needed to identify CA functions and keep the dialog and technology up to date.

Companies applying a CA must be aware that it is *"a continuous software development process in which numerous hurdles can arise"* (E_{17}), (e.g., during extending functions, with poorly documented, not NLP-ready knowledge, calling for AI trainers) ($E_{4,14}$).

CA Implementation: **DP$_5$** prerequisites the integration of CA in technical and organizational structures to ensure usability and cognitive relief for service employees (**MR$_4$**). Work integration is necessary to guide the user effectively and efficiently through the process and, if required, to get in touch with a service representative [13, 69]. **DP$_6$** strives to target CA and organizational preparation to ensure seamless integration. CA-related education, and user preparation should be managed pre-rollout to fulfill expectations [10, 11]. Moreover, a high level of maturity (functional, technical, and interactional) should ensure long-term involvement. E_2 and E_3 recommend a successive CA launch with gradual approval of small user groups in which functions are improved (e.g., dialog design and NLP behavior) to avoid limited maturity (**MR$_2$**).

CA Operation and Control: Finally, per **DP$_7$**, a CA application demands the establishment of ongoing monitoring activities, including novel skills and roles (**MR$_5$**) to uncover the actual CA behavior toward end-users and thus the potential for improvements (**MR$_8$**). **DP$_7$** may be instantiated by providing the user with diverse feedback options in the interaction (free text, star rating/button, questionnaire, forwarding), collaboration with service employees, frequent monitoring activities (usage indicators, chatlog/request analysis), as recommended by $E_{8,16}$.

5 Discussion

Although CAs are an emerging AI-based IS for customer service, resulting in various use cases and research studies [15], CA applications often neglect long-term success [1, 23] and inhibiting influences in companies [10]. Current knowledge on CAs focuses on individual, conceptual, or technical design perspectives [15, 19-22]. However, our research revealed that CAs fail due to organizational and employee-dependent issues in CAs' lifecycle. First authors already call for a *"switch from CA design research to [...][a] management view [...][, since] organizational and individual issues have the highest influence"* [10, p. 12f.] and for *"practice-based requirements[, which] can provide insights that may not have been captured in scientific literature"* [1, p. 5827]. We address this gap contributing to CAs' management in organizations by providing design knowledge for practitioners on how to establish and manage first CA lifecycle activities. Our research supports previous CA contributions [10, 11] that emphasize that although some core issues in conventional IS management are similarly present in the CA lifecycle, CAs need a dedicated perspective due to more specific characteristics: First, the impact of AI from an organizational perspective has been insufficiently studied [74], although various AI applications require dedicated in-depth research for leveraging AI's business value [75]. Few articles explore AI adoption factors [27, 28, 75]. Related, research do not address issues for managing the CA lifecycle and how the CA LCM activities differ from previous LCM frames, such as [29]. CAs' management has numerous novel activities that other AI applications (e.g., image recognition) do not possess, usually tend to be more data-model-, and IT-department-centric. Some of the issues AI literature (e.g., long-term management support or data quality) [27, 75] align with CA management issues. But CAs as learning, dialog-based, and social IS [18] possess a strongly human-dependent lifecycle and depend on new collaborations, and common continuous development/training and monitoring activities between IT departments and affected business units **(DP$_7$)** [11]. CA training requires new roles and interdisciplinary team structures to perform tasks such as preparation of NLP-ready data sets, managing intents, and writing compelling conversations, while also being aware of organizational influences and enduring communication with domain experts **(DP$_2$)** [24], who also need freedom (**DP$_4$**). Yet, no research describes the individual activities, diligence, skills, means of communication, or relations with domain experts in a CA lifecycle, which is a follow-up topic needing more in-depth investigation.

Second, a CA application must consider an integration into existing company and IT structures for a seamless user experience (**DP$_5$**). Contributions [69] present the first approaches to integrating CAs in service desk processes. However, our results show that integration with actual company tasks is a scarcely considered aspect in research.

Finally, CA applications need an initiation and integration process besides the pure development [29] to ensure org-readiness for facilitating the business problem–CA fit (**DP$_1$**) and ensuring user adoption at the CA rollout (e.g., with sufficient CA maturity and not alienating users) (**DP$_6$**). However, attitudes toward CAs may be negative due to limited skills and poor initial integration. Many articles address CAs' design, but few deal with an overarching maturity. Further studies need to explore CAs' maturity criteria for measurement to validate the CA in the lifecycle activities beforehand.

6 Conclusion and Limitations

AI-based CAs accelerate customer-focused and competitive customer service, leading to new applications and research studies. However, current research disregards CAs' lifecycle management, although the application poses entirely new challenges for companies. We contribute by conducting an SLR and an empirical interview study with CA experts to reveal issues and provide design knowledge to manage the CA lifecycle.

This study is faced with some limitations. First, the European experts in this study and their domain-specific experiences influence the study's external validity. In this context, we have drawn on existing company and research project contact networks. However, many experts work at international companies from diverse industries and offer various experiences and sufficient data saturation [1, 76]. Particularly, our derived design knowledge is dependent on a concrete instantiation. By suggesting the DPs, we contribute to managing the CA lifecycle, but the DPs require contextualization for the individual use-case. In this context, the next step would be to first evaluate, and then improve and instantiate the DPs in a concrete research project with corporate partners.

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