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Chatbots at Digital Workplaces – A Grounded-Theory Approach for Surveying Application Areas and Objectives

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Abstract

Background: *Chatbots are currently on the rise as more and more researchers tackle this topic from different perspectives. Simultaneously, workplaces and ways of working are increasingly changing in the context of digitalization. However, despite the promised benefits, the changes still show problems that should be tackled more purposefully by chatbots. Application areas and underlying objectives of a chatbot application at digital workplaces especially have not been researched yet.*

Method: *To solve the existing problems and close the research gap, we did a qualitative empirical study based on the grounded-theory process. Therefore, we interviewed 29 experts in a cross-section of different industry sectors and sizes. The experts work in the information systems domain or have profound knowledge of (future) workplace design, especially regarding chatbots.*

Results: *We identified three fundamental usage scenarios of chatbots in seven possible application areas. As a result of this, we found both divisional and cross-divisional application areas at workplaces. Furthermore, we detected fifteen underlying objectives of a chatbot operation, which can be categorized from direct over mid-level to indirect ones. We show dependencies between them, as well.*

Conclusions: *Our results prove the applicability of chatbots in workplace settings. The chatbot operation seems especially fruitful in the support or the self-service domain, where it provides information, carries out processes, or captures process-related data. Additionally, automation, workload reduction, and cost reduction are the fundamental objectives of chatbots in workplace scenarios. With this study, we contribute to the scientific knowledge base by providing knowledge from practice for future research approaches and closing the outlined research gap.*

Keywords: Chatbot, Workplace, Qualitative Study, Application Area, Objective.

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Introduction

In recent years, a new trend for supporting employees in daily work scenarios emerged: the application of chatbots, i.e., artificial intelligence and natural language-based human-computer interfaces (Følstad & Brandtzæg, 2017; Reshmi & Balakrishnan, 2016). Even though the technology has been around for a long time, new technological advances are giving it a new rise (Dale, 2016). Additionally, as with the current progressing digitalization of established working practices and the redesign of the workplace, employees, and the way they work are concerned. More innovative and private-known digital technologies are used to enhance the working quality (Byström, Ruthven, & Heinström, 2017; Köffer, 2015; Lestarini, Raflesia, & Surendro, 2015; White, 2012). Despite these advantages, the increasing use of information systems and necessary information sources leads to information and application overload. Regardless of the spread of new and smart systems, information access is still a major problem at workplaces as employees sometimes cannot find the information they need or do not know what to look for. Thus, it takes longer to search, edit, and share information negatively affecting productivity instead of improving it (Carayannopoulos, 2018; Lebeuf, Storey, & Zagalsky, 2017; Russell, 2012; White, 2012). Hereto, nowadays user-centric information systems, like chatbots or conversational agents, are been applied as a new and intuitive form of human-computer interface. Thereby, chatbots automate tasks, filter necessary information for work execution or assist in the daily work tasks. Thus, employees can carry out their work and reach their respective goals without much training due to a natural communication regardless of specific phrases (Følstad & Brandtzæg, 2017; Reshmi & Balakrishnan, 2016; Richter, Heinrich, Stocker, & Schwabe, 2018). However, besides the currently common application of chatbots in customer service or employee support scenarios, the scientific knowledge base is, to the best of our knowledge, still limited. In particular, the use of chatbots at the workplace to support daily tasks is barely considered. Prior studies focus mostly on general information acquisition as an application area, e.g., (Carayannopoulos, 2018; Reshmi & Balakrishnan, 2016), or general design aspects like gender and response behavior, e.g., (Feine, Gnewuch, Morana, & Maedche, 2019; Go & Sundar, 2019). Additionally, the studies often only focus on particular use cases and design corresponding chatbots without regarding underlying requirements in detail. However, this current research is not related on the professional workplace and would have to be transferred in the first place, if at all.

This is especially important since in professional working environments deviating requirements on the technology exists, e.g., data security, business-critical transactions, or the already stated information and application overload. However, business applications are dependent on decisions by the management and mostly driven by economic aspects. Thus, only if the use case is viable, a chatbot operation is performed. Additionally, the more natural language interfaces receive attention in private life and been used for different tasks, the more employees demand to integrate them into their daily work. Even if companies are increasingly turning to this consumerization, it is not easy to introduce systems that are available on the market (Koch et al., 2014). On the one hand, functions are sometimes provided that are not relevant in everyday business. On the other hand, the systems must be able to be integrated with company systems in order to be able to carry out business processes. This also leads to integration problems and data security and safety concerns. Thus, in business contexts, it makes more sense to design own systems based on the respective requirements. Hereto, not necessarily all private-known application areas of chatbots lead to advantages but can be used as a starting point. Additionally, the current private application areas of chatbots cover many areas of daily life or entertainment, such as organization and smart home control. For transferring the technology of chatbots to workplaces, however, it must be surveyed whether these scenarios also exist in the company in order to be able to build on existing results and not to include systems whose functionalities do not address the tasks of everyday office life. Thus, it is necessary to survey the application areas as well as connected objectives. As shown, the viable application areas, besides information acquisition, are either unclear or the

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technology is only suitable for the areas of knowledge examined. Thus, as chatbots should support employees in the daily work, where further tasks and requirements arise, the current scientific knowledge cannot guide in decision-making processes, when planning to integrate chatbots in the workplace. Hence, it is necessary to identify established or potential application areas within the practice in order to make realistic and practical problems as well as knowledge available for science. Additionally, as requirements are lacking, corresponding requirements in these application areas should also be examined. Otherwise, a chatbot could not be developed appropriately, or requirements are not implemented. A further essential factor in the application of chatbots in a professional working environment are the related objectives. As decisions in a business context are often made on possible achievements, a guideline for this is necessary. This allows decisions to be taken if the intended objectives could be achieved. However, although application areas and objectives are critical issues in the professional working context, this is currently not properly addressed in the scientific knowledge base (Meyer von Wolff, Hobert, & Schumann, 2019). Hence, open research questions exist, which must be answered to survey the application of chatbots in workplace settings comprehensively.

Thus, the aim of the contribution is to create a basis for chatbot development in digital workplace contexts. For this purpose, it is important to identify meaningful areas of application and to point out related objectives. These results are to be shown in general for digital workplaces independent of industry so that design research studies can be based on them in order to obtain generalizable results as a foundation for subsequent chatbot development processes at the professional digital workplace. Thus, we survey application areas and related objectives, which can be used in different workplace settings as a foundation for subsequent studies. Therefore, we have oriented ourselves on the research agenda of (Meyer von Wolff, Hobert et al., 2019) and used this as a starting point for the following research. Hereto, we did an empirical cross-section interview study among practitioners and experts of German companies. In doing so, we want to survey the application of chatbots in a professional working environment, and to enable a transfer from the already established consumer-oriented applications. Thus, we focus also on the organizational level, as the introduction of technologies in professional working environments is mainly based on organizational decisions instead of being based on individual ones. To address the current situation in the scientific knowledge base, we survey tasks performed by chatbots and viable application areas at digital workplaces. The results are based on a paper presented at *the 25th Americas Conference on Information Systems* (Meyer von Wolff, Masuch, Hobert, & Schumann, 2019). To further contribute to the scientific community, we extend the results with additional insights into the underlying objectives of chatbot systems, or rather their application and an extended discussion of the results. Hence, based on the open research questions described in (Meyer von Wolff, Hobert et al., 2019), and the underlying necessity to examine application areas, their relevant tasks as well as underlying objectives, we address the following three research questions in this research article (see Table 1):

Table 1 - Research Questions	
RQ1	*Which usage scenarios can be performed by chatbots at the digital workplace?*
RQ2	*What are the possible application areas for chatbots at digital workplaces?*
RQ3	*What are the objectives of a chatbot application at digital workplaces?*

To answer these questions, the remainder of the article is structured as follows. Next, we point out the theoretical background of the paper: chatbots and digital workplaces, as well as the related research. After that, we will describe our research design of the empirical study. Following, we will present the tasks and application areas of chatbots at digital workplaces. Next, we describe (underlying) objectives of the application of chatbots as well as dependencies among them. Afterward, we will discuss our findings. We conclude our article by highlighting limitations and implications and briefly summarizing the research results.

Theoretical Background

In this chapter, we describe the theoretical background. Firstly, we describe chatbots and their underlying technical concepts. Secondly, we briefly define the concept of digital workplaces. Thirdly, we point out the current state of chatbot research to outline the relevance of the topic.

Chatbots at Digital Workplaces

Chatbots are a special kind of information system that uses artificial intelligence technologies to provide a natural language user interface. Since the first applications of conversational information systems, e.g., *ELIZA* (Weizenbaum, 1966) or *ALICE* (Wallace, 2009), different approaches were pursued. Independent of the technological advancements of the last years and the use of different synonyms, e.g., chatbot, chatterbot, conversational agent, or digital agent, the main characteristics have not changed (Dale, 2016). By inserting text or audio, the user can communicate naturally and intuitively via a dialog-based interface with the information system (Lebeuf, Storey, & Zagalsky, 2018). Therefore, a chatbot allows access to various knowledge bases or via application programming interfaces (APIs) to other information systems or (web) services (Al-Zubaide & Issa, 2011; Angga, Fachri, Elevanita, Suryadi, & Agushinta, 2015; Carayannopoulos, 2018; Mallios & Bourbakis, 2016). In addition, a chatbot can perform its actions reactively and proactively as well as autonomously based on environmental conditions. Also, a chatbot is, to a certain extent, adaptive and capable of (self) learning.

Nowadays, chatbots are being applied in different domains, e.g., customer support, home automation, education, or digital professional workplaces. However, the latter is often used nowadays but not defined commonly. Therefore, to enable research studies for chatbots at workplaces, it is necessary to define the concept of a digital workplace beforehand. The design of workplaces already has a long tradition in human-oriented computer science (Richter et al., 2018). A digital workplace is not limited to a physical location. Instead, it is a combination of work duties, information-related tasks, e.g., searching, transforming, or documenting, and the required information systems. It is, thus, location-independent and sometimes mobile. The mentioned information-centric work is nowadays, also referred to as knowledge work (Lestarini et al., 2015; White, 2012). Thus, we target, or rather examine, the information-heavy tasks, e.g., professional business and support processes, and not the production processes (Rüegg-Stürm, 2005)

In terms of the technical-perspective, chatbots usually consist of three essential components, which are used via a *human-computer interface* (see Figure 1) (Berg, 2014; Mallios & Bourbakis, 2016). In the *natural language processing* component, the user input is transformed into a machine-readable form. Hereto, the text is analyzed, dismantled, and patterns are extracted. Also, the natural language processing generates a natural language output (e.g., audio or text) based on the results of the dialog manager. The *dialog manager* is responsible for the matching of the user input with the backend, by extracting content or executing functions. The *backend* consists of databases, information systems, or APIs. In this research, we focus on tasks and application areas of chatbots independently of a specific component design.

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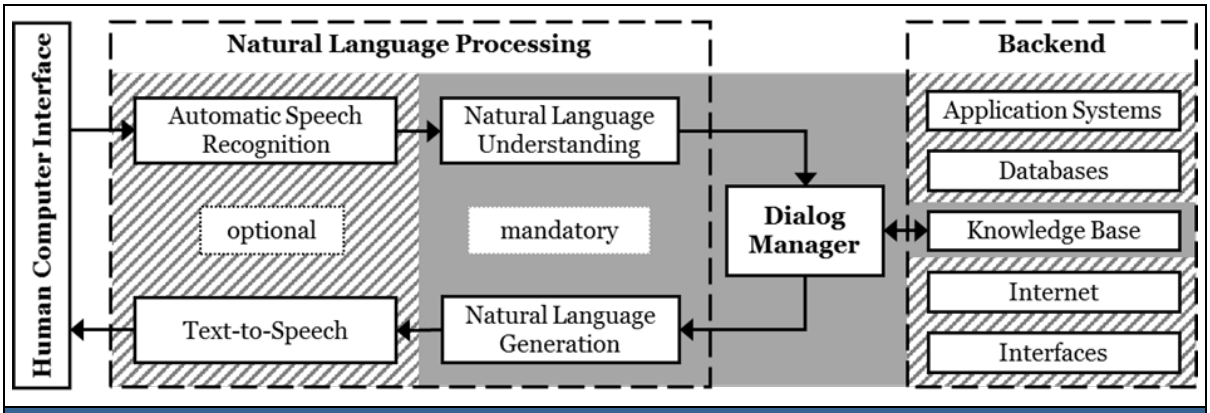

Figure 1 - Chatbot's architecture

Related Research

For several years, chatbot research has been on the rise as many researchers address the topic from different perspectives. As mentioned, first instantiations were pursued years ago by (Weizenbaum, 1966) and (Wallace, 2009). Since these early prototypes, different approaches have been undertaken that focus mainly on the application areas by design research or through some kind of meta- or application area-independent research.

For the first group, the current research focuses mostly on various ***chatbot instantiations*** for the domains customer support, information provision, education and training, or digital workplace, as already shown in (Meyer von Wolff, Hobert et al., 2019). A selection of some relevant contributions is shown in Table 2.

Hereby, in the area of customer support, the current research addresses topics on how to enhance the chatbot usage for the customer. In doing so, researchers show that in general, the finding of solutions is accelerated. Also, longer interactions are possible, if a comprehensive mapping of the possible question paths is available. This can also contribute to better context processing. However, most chatbot providers offer extensive tools for customer support to create appropriate chatbots.

Additionally, information acquisition is mostly a topic of interest in design research. In doing this, the researchers try to analyze communication patterns, which should be implemented to enhance the tasks. Also, many researchers focus on specific instantiations for information acquisition, which differ in the objectives: information acquisition in general or from workplace software. Due to the generalizable characteristics of this research, these results are most likely to be reused for the digital workplace.

A further application area that receives attention currently ist the education domain. Besides some state of the art analyses, the researchers apply chatbots in educator-learner interaction. In doing this, chatbots should provide individualized and adaptive learning content, or answer questions of the learner. Also, some of them already point out design recommendations for chatbot artifacts. However, even if the higher education, as studied in prior studies in the higher-education domain, does not correspond directly to digital workplace tasks, education is also relevant for in today's work. Thus, in general, the results could be transferred if this is an intended task.

Lastly, some research is conducted in the area of the digital workplace. Hereby, it is surveyed how chatbots can contribute to group settings, e.g., reducing friction or improving performance. Also, some research tackles the ideation, or rather the design thinking, which is often used in today's businesses. Hereto, studies are conducted to survey how chatbots can be used to

support the idea generation, where the chatbot is a mean to contribute ideas to an idea platform or a moderator for a design thinking process. Thus, relevant workplace tasks, or (business) processes are currently not surveyed by the community.

Table 2 – Current chatbot instantiations in scientific research

Domain	Contribution to chatbot research	Exemplary references
Customer support	Faster information provision through natural interaction	(Chai et al., 2001)
	Goal fulfillment map-based chatbot for longer and dynamical interactions	(Chakrabarti & Luger, 2015)
	Overview of functionalities of chatbot providers to enhance the customer interaction	(Johannsen, Leist, Konadl, & Basche, 2018)
Information acquisition	Communication patterns for information acquisition with chatbots	(Radlinski & Craswell, 2017)
	Concept for an ontology-based chatbot	(Al-Zubaide & Issa, 2011)
	Chatbot instantiations for information acquisition	(Carayannopoulos, 2018), (Ranoliya, Raghuwanshi, & Singh, 2017)
	Workplace-related information acquisition with chatbots, e.g., ERM or CRM	(Reshmi & Balakrishnan, 2016)
Education	Literature review for chatbot potentials in education	(Winkler & Söllner, 2018), (Hobert & Meyer von Wolff, 2019)
	Development of intelligent tutoring or learning systems; with partly design recommendations	(Fonte, Rial, & Nistal, 2009), (Hobert, 2019), (Vladova, Haase, Rüdian, & Pinkwart, 2019), (Winkler, Hobert, Salovaara, Söllner, & Leimeister, 2020)
	Conceptualized architecture for higher education chatbots	(Sjöström, Aghaee, Dahlin, & Agerfalk, 2018)
Digital Workplace	Reduce friction in collaborative teamwork with chatbots	(Gyton & Jeffsry, 2017)
	Improvement of group performance in problem-solving scenarios with chatbots	(Winkler, Neuweiler, Bittner, & Söllner, 2019)
	Ideation and design thinking with chatbots; with partly design recommendations	(Bittner, Küstermann, & Tratzky, 2019), (Tavanapour & Bittner, 2018), (Tavanapour, Poser, & Bittner, 2019), (Strohmann et al., 2018)
	Chatbots as a mean for feedback exchange	(Lechler, Stoeckli, Rietsche, & Uebernickel, 2019)

Instead of investigating individual application areas, some researchers try to examine the ***application of chatbots*** in general.

For instance, (Stoeckli, Uebernickel, & Brenner, 2018) show functional affordances, e.g., receiving notifications, updates or information, etc., of chatbots and how a chatbot can provide value. In doing this, they also point out the usage settings of chatbots. However, they conducted a study with mostly Swiss participants. A similar approach was made by (Lee et al., 2019), who conducted a requirements analysis for the application of chatbots for career advising. Also, in (Laumer, Gubler, Racheva, & Maier, 2019), use cases of conversational agents were pointed out, e.g., information retrieval or work & office. Nevertheless, they did not focus on the digital workplace directly, and, additionally, some private areas of use are also listed, e.g., smart home control, goods & services, or music entertainment. Furthermore, (Gnewuch, Morana, & Maedche, 2017) try to summarize the application of chatbots in

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customer service by showing generalizable design recommendations. The most similar research was conducted by (Feng & Buxmann, 2020), who also identified areas of application for conversational agents for workers. However, this research was based only on the literature without taking into account opinions from practice.

Furthermore, some research focus on the user experience or the motivation to use chatbots (Følstad & Skjuve, 2019), or the perceptions of the user when applying chatbots (Wuenderlich & Paluch, 2017). In addition, the aims and intended effects of a chatbot application where surveyed (Rzepka, 2019). Hereby, fundamental, e.g., efficiency, ease of use, convenience, etc., and means objectives, e.g., hands-free and eyes-free use, naturalness of conversation, ensure trust, etc., are described. Also, (Stieglitz, Brachten, & Kissmer, 2018) propose a research model to examine factors influencing the intention to use an enterprise chatbot, like trust, efficacy, and so on.

Besides the research that focusses on application areas and instantiations, some researchers survey ***design features*** of a human-like chatbot or ***influences*** of chatbot applications.

For instance, (Go & Sundar, 2019) survey aspects for humanizing chatbots, e.g., anthropomorphic visual cues or high levels of contingent message exchanges. In addition, (Liebrecht & van Hooijdonk, 2020) also examine human response behavior as a requirement for creating more human-like chatbots. Also, the impacts of anthropomorphic and functional features on the acceptance of chatbots, which are implemented in enterprise application systems, are surveyed (Rietz, Benke, & Maedche, 2019). The results show a high impact of anthropomorphic design features on perceived usefulness. A similar approach can be found in (Montero & Araki, 2005), who enhance the dialog through human-like characteristics based on the observed behavior of the structure of a human chat. Similarities and differences between human-chatbot and human-computer interaction were elaborated (Nguyen & Sidorova, 2018) as well. In (Schuetzler, Grimes, & Giboney, 2018), the influence of chatbots' conversational relevance on the perception of humanity and engagement are surveyed. The results show that conversational agents, who give conversationally relevant responses, are perceived as more human-like and socially, which is quite obvious and should be intended. To extend this, in a recent study by (Gnewuch, Morana, Adam, & Maedche, 2018), the influence of artificial response delays in the chatbot dialog where examined. They show that in particular dynamic delays have the highest influence, and should be used in chatbot systems. Also, the influence of different features, e.g., high vs. low message interactivity or platform self-disclosure, for the case of onboarding was surveyed (Adam & Klumpe, 2019).

Furthermore, some researchers investigate gender-aspects of chatbots (Feine, Gnewuch, Morana, & Maedche, 2020). Based on their results, they hint at which circumstances a specific gender should be applied. In another publication (Feine et al., 2019), a survey was done on the conversation between humans and chatbots by conducting a structured literature review and deriving a taxonomy of social cues in conversational agents. The effects of gender, as well as the user's subjective knowledge, are also investigated by (Pfeuffer, Adam, Toutaoui, Hinz, & Benlian, 2019), who show that female agents and stereotypical female traits increase the user's perceived competence of the chatbot.
Especially trust factors are a topic in chatbot research as well. Hereby, (Seeger, Pfeifer, & Heinzl, 2017) survey this by identifying factors to enhance and support trust in a theoretical model based on hypotheses. Additionally, trust aspects when applying chatbots in healthcare contexts are examined. In doing this, also a first theory of trust was developed (Wang & Siau, 2018). A last identified contribution tackles trust in the case of assistive robots at the workplace (Stock et al., 2019). Hereto, they developed a model to measure these trust aspects. However, they focus on robots and not on conversational agents, as described in this research, the results can be transferred, as both technologies are based on artificial intelligence and natural language processing. As all of this is a kind of meta-level research, or rather, application area

independent research, the corresponding findings should be used for a specific chatbot implementation.

Lastly, a few researchers try to summarize current findings of the scientific knowledge base in ***(literature) reviews***, which can help by finding open research topics and relevant papers for future research. Hereby, the current state of the art on chatbot or conversational agent research was summarized by (Diederich, Brendel, & Kolbe, 2019; Meyer von Wolff, Hobert et al., 2019). (Maedche et al., 2019) addressed this by highlighting application areas, opportunities, and future settings, which was also done by (Seeber et al., 2019). Furthermore, all four papers point out future research perspectives and open questions. A different approach was done by (Rzepka & Berger, 2018), who review the user interaction with ai-enabled systems. Lastly, (Følstad & Brandtzæg, 2017) try to summarize the chatbot topic on a practical level, with highlighting implications and opportunities for the human-computer interaction with this new application system as well.

Thus, when **summarizing the current research**, we identified a focus on design research for the application areas of information acquisition and customer service. However, fewer researchers address the application of chatbots in professional workplace contexts, which is necessary to provide a basis for design research and successful chatbot projects in practice. Instead, often chatbots have been developed for specific general applications without focusing on professional digital work, and, thus, these guidelines are missing. Nevertheless, in principle, it can be assumed that results from previous or general studies are transferable. For this purpose, however, it should first be checked which application areas at the workplace are suitable in order to transfer results from research dealing with these areas in other contexts. It is also necessary to check whether all research areas are relevant and transferable – the information acquisition or customer support is most likely to be transferable (Stoeckli et al., 2018) – or whether individual areas are not necessary for the workplace, e.g., smart home control (Laumer et al., 2019). Nonetheless, the current research perspectives and their application areas can be used as an indicator of possible application areas for workplace use, and thus, they should be transferred. This is especially important for a variety of design recommendations or features, as discovered in the application-independent research. These results should necessarily be taken into account when implementing specific chatbots, as they are a kind of meta-requirements or general design guidelines. Nonetheless, the suitability of each feature should be verified for each target application area at the digital workplace.

However, the current research gap starts earlier: finding the possible use cases; because, as mentioned before, there is currently no research on this for the professional workplace context. Hence, in a first step, possible application areas should be derived and examined beforehand, which was already done by a few researchers, even if not for the digital workplace. In addition, current research does not yet comprehensively show any objectives or effects that should be achieved with a chatbot operation. Thus, on an organizational-level, practitioners do not have an overview of possible application scenarios and objectives of chatbots in workplace settings, which can lead to wrong decisions. Additionally, for scientific research, application areas and objectives are necessary when designing and implementing chatbots, as well as when deriving theories for the application of chatbots in the digital workplace. Nonetheless, many studies exist that address single or a selection of necessary issues, whose results should be taken into account and transferred to future studies. However, without a comprehensive overview, the risk remains that individual and essential aspects are not considered.

Thus, summarizing the current research, we could derive a lack of research on application areas of chatbots at professional digital workplaces, as well as on underlying objectives. Hereto, building on former studies of (Følstad & Brandtzæg, 2017; Maedche et al., 2019; Meyer von Wolff, Hobert et al., 2019; Seeber et al., 2019; Stoeckli et al., 2018), we conduct a practice-oriented expert study to address the current situation in the scientific knowledgebase. The results of which are outlined in the following sections.

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Research Design

To identify the usage scenarios (*RQ1*), application areas (*RQ2*) as well as underlying objectives (*RQ3*) of chatbots at digital workplaces, we conducted a qualitative empirical interview study based on (Döring & Bortz, 2016; Myers, 2013). As described in (Wiesche, Jurisch, Yetton, & Krcmar, 2017), we followed the grounded-theory process to obtain a description of possible chatbot tasks, application areas as well as underlying objectives. In order to conduct the study, we applied several grounded-theory procedures to survey the research area explorative under consideration of the situational conditions of expert interviews (see Table 3).

Table 3 - Categorization of research design

Contribution	Theory		Model		Rich description	
Procedures	Theoretical sampling	Role of prior theory		Open coding		Memoing
	Axial coding	Selective/Theoretical Coding		Constant comparison		Coding paradigm/families

We followed a three-step process for our study: *First*, we selected potential interview partners based on personal contacts from projects or fairs and an internet search. Therefore, we interviewed experts who deal with current topics and trends of digitalization, particularly chatbots or natural-language user interfaces. To ensure quality, every expert in our interview study had at least a few months of working practice in the workplace design. In addition, the experts should work either in companies, which plan or already use chatbots, or in software firms, which develop chatbots for workplaces. Thus, this sample group is capable of:

(1) assessing the influence of the technology, and evaluating how chatbots may redesign the digital workplace of the future;

(2) having knowledge about current or future applications areas of chatbots at the digital workplace.

To ensure heterogeneity and achieve a comprehensive cross-section for the research domain, we include experts independently of the industry sector. Hence, we want to achieve results that can be applied in general workplace settings and are not biased for a specific industry or work environment. We contacted the identified potential experts by e-mail and sent them a leaflet about our research project. Overall, 29 out of 68 contacted experts have agreed to participate in the study (43 %; see Table 4). The high participation rate already pointed out the relevance of the research area and the enterprises' interest. Hereby, the participants' group consists almost entirely of German experts.

Table 4 - Description of the experts participated in the study

ID		**Position**	**Industry**
INT01	EXP01	Project Leader	Information & Communication Technology
INT02	EXP02	CEO	Information & Communication Technology
INT03	EXP03	Product Owner	Automotive Engineering
INT04	EXP04	Subject Specialist	Automotive Engineering
INT05	EXP05	Online Editor / Consultant	Information & Communication Technology
INT06	EXP06	Senior Manager	Other services
INT07	EXP07	Head of Department	Finance & Insurance
INT08	EXP08	Team Leader / Consultant	Information & Communication Technology

Table 4 - Description of the experts participated in the study			
ID		**Position**	**Industry**
INT09	EXP09	Consultant	Finance & Insurance
INT10	EXP10	Digital Engineer	Finance & Insurance
INT11	EXP11	CEO	Information & Communication Technology
INT12	EXP12	Leading AI-Architect	Information & Communication Technology
INT13	EXP13	IT Service Manager	Chemicals, Pharmaceuticals & Raw Materials
	EXP14	IT Service Manager	Chemicals, Pharmaceuticals & Raw Materials
INT14	EXP15	Lead IT Architect	Chemicals, Pharmaceuticals & Raw Materials
INT15	EXP16	CEO	Information & Communication Technology
INT16	EXP17	Head of Controlling & ICT	Other manufacturing
INT17	EXP18	Major Account Executive CE	Other services
INT18	EXP19	Director Information Management	Finance & Insurance
INT19	EXP20	Divisional Management	Other services
INT20	EXP21	Business Development Manager	Information & Communication Technology
INT21	EXP22	Executive Board	Information & Communication Technology
INT22	EXP23	CEO	Information & Communication Technology
INT23	EXP24	Expert Sales Manager	Information & Communication Technology
INT24	EXP25	Account Manager	Information & Communication Technology
	EXP26	Senior Consultant	Information & Communication Technology
INT25	EXP27	Technology Manager	Other services
INT26	EXP28	Head of Workplace Services	Information & Communication Technology
INT27	EXP29	Project Manager / Service Developer	Finance & Insurance

Second, prior to the interviews, we sent the experts a pre-questionnaire, along with an information sheet for the introduction of the relevant terms (i.e., chatbot and digital workplace) as well as a privacy policy. The introduction in the relevant terms should clarify our research project and the relevant foundations to allow a common understanding of the topic. In the following, we conducted the interviews face-to-face or via phone from July to October 2018. These lasted from 31 to 94 minutes (mean: 54:07 min.; median: 51:50 min.). To leave the interviewees enough room to express their own ideas, we used a semi-structured interview guideline to conduct the interviews. Therefore, we used the following leading questions as a basic structure (see Table 5). We stopped the survey when no new insights were revealed in the last interviews according to the theoretical saturation by (Glaser & Strauss, 2006). If the privacy policy was accepted, the interviews were recorded on tape and afterward transcribed. Otherwise, we used intensive note-taking to document the results.

Table 5 - Leading Questions of the interview guideline	
Use cases	▪ Do you use or plan to use chatbots in your company? ▪ For which tasks or application areas are chatbots applied? ▪ Which tasks are supported by a chatbot? ▪ What are the characteristics of a chatbot task? ▪ For which scenarios can a chatbot not be used? ▪ What are the potential future application scenarios?
Underlying objectives	▪ What are the objectives of the chatbot operation? ▪ What outcomes have been achieved?

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Third, we analyzed and coded our transcripts by using a structured content analysis approach. To obtain more detailed insights in the application areas of chatbots at digital workplaces, we have done our coding and analysis in three steps, followed by a subsequent categorization. First, we analyzed the mentioned tasks performed by chatbots to determine the necessary functions (*RQ1*). Second, we looked for the mentioned application areas related to chatbots. Additionally, we assigned the aforementioned tasks to the identified application areas to map the needed functional scope (*RQ2*). Third, we collected mentions for underlying objectives in the transcripts (*RQ3*). The identified objectives were mapped to the corresponding target category lastly. The coding was done by two researchers independently using continuous analysis of the transcripts, followed by an assignment of the codes to the core topics (Mayring, 2014). Since the survey and analysis were conducted in German, we translated the final coding into English while preserving the meaning. The corresponding results are outlined in the following.

Results

In the following, we show our results of the qualitative interview study. Hereto, we describe our sample first. Secondly, we present the derived chatbot tasks and, subsequently, the possible application areas at digital workplaces along with a brief assessment of the deployment scenario. Lastly, we point out the purposed objectives of a chatbot operation.

Sample Description

Our sample consists of a cross-section of different industries (see Figure 2). The interviewed experts mostly work in the information & communication sector (approx. 48 %) followed by finance & insurance (approx. 19 %), and other services (approx. 15 %). The information and communication-industry seem overrepresented in our sample. This might be explained as experts from outsourced IT-departments or (exclusive) IT-business partners, e.g., for insurance or automotive, are contacted as well. Furthermore, chatbots or their application is an information technology-driven initiative, which can also explain the distribution. Additionally, experts from many different company sizes, measured in the number of employees, participated (see Figure 3). Mostly medium-sized with 1.001 to 5.000 employees (approx. 26 %), followed by very large companies (approx. 22 %), and companies with less than 50 employees (approx. 15 %) participated in our study. As with the industry sector, we could acquire a cross-section of different company sizes.

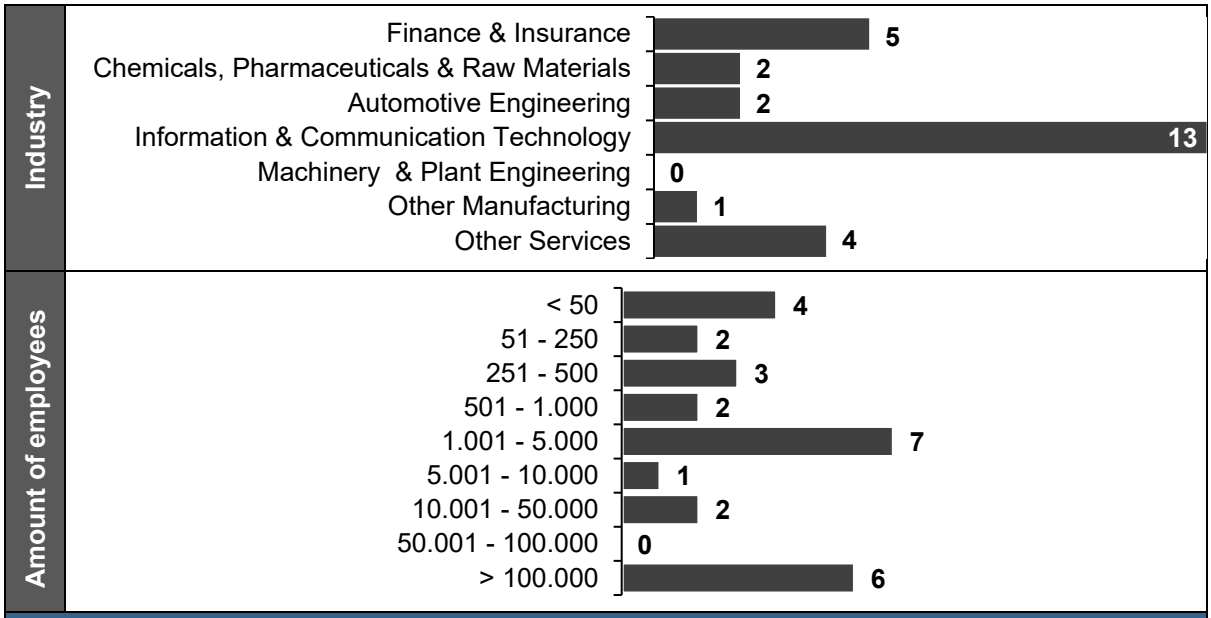

Figure 2 - Sample characteristics of the companies (n=27)

Notes: Information is based on data the experts answered in the pre-questionnaire. Missing company data was researched and added manually in October 2018. n=27

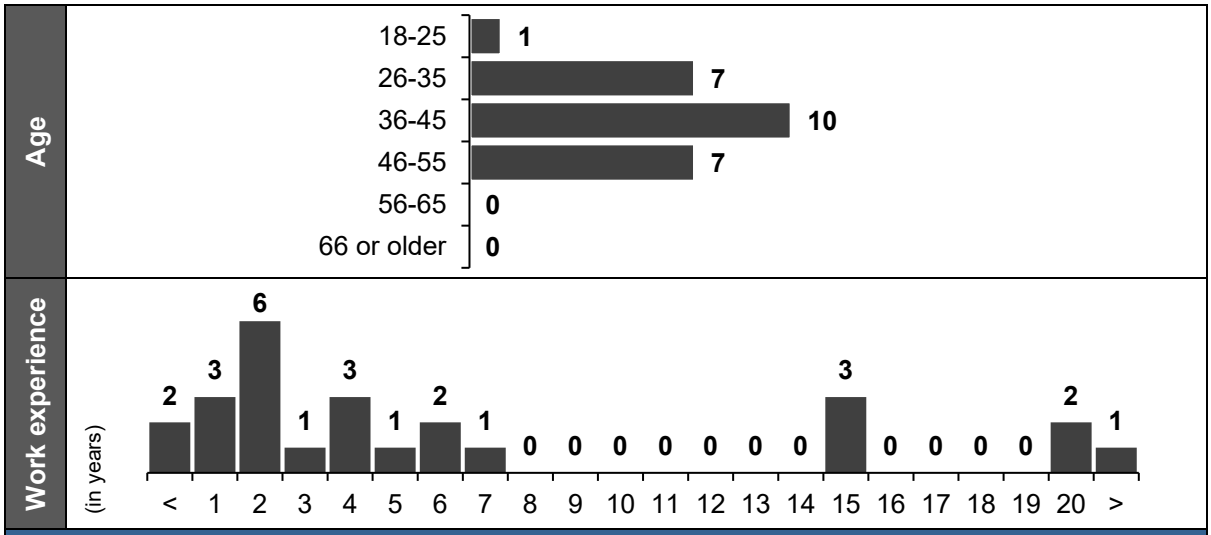

Figure 3 - Sample characteristics of the participants

Notes: Information on the basis of the pre-questionnaire. n=25.

As part of the pre-questionnaire, we prompted the current state of the chatbot application (see Figure 4). As shown, most of the participating companies already operate chatbots for various workplace tasks (80 %). However, despite one company where a chatbot application is currently no option, another four companies plan for a future chatbot operation. Thus, the high relevance for chatbot applications for workplace tasks could be shown in our sample, as chatbots are already applied or will be applied soon.

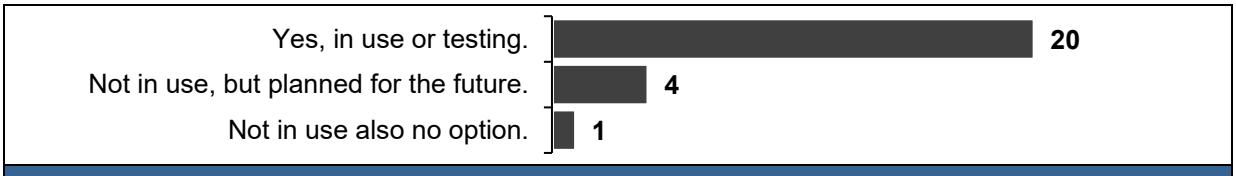

Figure 4 - Current application situation

Notes: Information on the basis of the pre-questionnaire. n=25

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Chatbot usage

As the first step of the analysis, we aimed at identifying fundamental tasks a chatbot can perform (*RQ1*) at the digital workplace. These usage scenarios typically represent the general functions of chatbots independent of a respective application area. By doing this, our analysis revealed the three usage scenarios or functions of a chatbot: information gathering, process execution, and information provision (see Table 6).

Table 6 - Information capture with chatbots at digital workplaces

U_1	Information capture	n=16
Quotes	**Structured input**	**n=12**
	"*Concrete example from practice, I think, for example [company name], that is, this direct insurer, are beginning to introduce very simple forms of chatbots, form-based chatbots.*" (EXP22)	
	"*[...] the bot then asks me, for example, "what is your username?" and then it asks for some more information. And with the help of this information, it can then contact other systems to get more information and use all the information it has collected [...]*" (EXP12)	
	"*[…] a running pilot on how to do this time tracking based on phone calls with an automatic dialog, which is very intelligent in speech recognition. [...] to actually get data input by voice or also by dialogues in such a semi-structured form, which one would otherwise have to submit by tablet or excel.*" (EXP27)	
	Unstructured input	**n=7**
	"*[...] to introduce a chatbot, which you can invite into the chat as a participant and this bot can then record by commands [...], please note as a resolution on the subject that we now want to proceed as follows […].*" (EXP11)	
	"*You could also use this, e.g., for requirement analysis, if you now want to query requirements from several users, then they can all do their requirements and this query [...] can then be supported by a virtual assistant.*" (EXP24)	
	"*[…] currently it is a running pilot on how to make this work time recording based on telephone calls with an automatic dialog. […] To get data input by speech or dialog into such a semi-structured form, which otherwise have to be submitted by tablet or by Excel or in any other way.*" (EXP27)	

Note: Counts based on the 27 interview cases

As a first chatbot usage, in the interviews, the **capture of information and data [U_1]** was mentioned (*n*=16). Hereby, different kinds of storage methods through chatbots are addressed.

Mostly (*n*=12) our participants, or rather their company, use or plan to use chatbots for the simple task of ***structured data input***. In doing so, often, the technological input basis is a data input form, which is implemented in a chatbot. By knowing the necessary input fields, the chatbot asks the users for their data (EXP22). This basic input functionality can also be extended by the chatbot constantly requesting further information from other systems in addition to the user input (EXP12). Additionally, the information capturing is not limited to written input by the user. As noted by (EXP27), they suggest using the speech for data input. By processing the spoken input, the chatbot is capable of inquiring intelligently only necessary information, and, thereby, translating the input into a simple semi-structured form, e.g., like a secretary.

Extending this simple form filling, some participants mentioned an ***unstructured data input*** (*n*=7). For example, one company plans to integrate a chatbot in the communication function of conference tools. By doing this, the chatbot can document and save decisions made in discussions, e.g., by storing either the whole dialog or only relevant excerpts (EXP11). Additionally, one participant uttered the idea that a chatbot can be used as a means for

knowledge management systems. By storing the relevant dialogs, the company-wide knowledgebase can be enhanced, and, e.g., new forms of training can be established (EXP27). A further possible usage represents chatbots as a kind of dictation machine. By using a non-specified input, or rather an open question, the chatbot can be used, for thinks like requirement analysis. In doing so, chatbots generate or capture content belonging to workplace-relevant topics, which have to be processed further in a different application system (EXP24). Nevertheless, already, the use as a dictation tool represents such a data capturing opportunity.

Besides the usage as a means for data capturing, the companies use or plan to use a chatbot for the **process guidance and execution [U_2]** (*n*=18) (see Table 7). Hereby, the kind of underlying processes distinguishes between the number of involved participants and the complexity of the process itself.

First and mostly (*n*=16), chatbots are used for processes with only a ***single actor***, where this actor communicates with the chatbot exclusively. Chatbots should support the employee to carry out workplace relevant tasks and processes, like master data changes, travel requests, or software installations. Hereto, employees control or execute the whole workflow in the chatbot dialog, fill out necessary fields, or execute corresponding actions (EXP03). However, similarities to the form input usage are existent. This is extended by the fact that the chatbot not only queries the fields, but also intelligently controls the process and data input at any time and, further, automatically starts subsequent tasks and processes. As with the main characteristics, the users only have to speak naturally with the chatbot and thus give him the orders to be executed. The chatbot processes these and executes the corresponding actions, e.g., resetting the passwords for information systems (EXP13). As summarized by one expert, everything, which can be mapped in a process-oriented manner, can be supported by a chatbot (EXP25). However, this can only be done if the process is not dynamical, and every possible further action is known, e.g., in a rule-based process.

Second, chatbots can perform processes with ***multiple actors*** (*n*=7), e.g., with approvals by supervisors or in coordination tasks in groups. Hereby, the chatbot handles, or rather, manages complex rule-based processes, which extends the first group of single actor tasks. In this scenario, the chatbot is capable of handling multiple actors, where every single actor has its own dialog with a chatbot. The chatbot manages all between all these individual chats and coordinates the decision process, e.g., in the case of meeting planning where the chatbot finally sets up an appointment (EXP16). Besides the simultaneous coordination between actors, a chatbot can also support processes where different actors are sequentially involved. Like in processes with approvals from supervisors, the chatbot first guides the user to the initial steps, and then forwards the request to the supervisor, who can accept or reject the inquire in his chatbot dialog. Afterward, the chatbot can inform the initial user about the decision and start the subsequent steps (EXP01, EXP28). Overall, for this usage, a chatbot manages between all involved actors and responds accordingly so that the process is executed correctly and no steps are forgotten or skipped.

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Table 7 – Process guidance and execution with chatbots at digital workplaces		
U_2	**Process guidance and execution**	**n=18**
Quotes	**standardized; single actors**	**n=16**
	"*Of course, such a scenario is a goal of chatbots. [...] to support workflow-based processes in which employees, run through a workflow or just fill out a form, in which fields build on each other [...].*" (EXP03)	
	"*[...] e.g., if someone needs a reset of their SAP password, [...] they could say "I need a new SAP password." Then the chatbot asks back on which SAP systems the reset should take place and then, if [the chatbot] is integrated, it could reset the password and tell the user the new password.*" (EXP13)	
	"*For us, the focus is on ensuring that everything that can be displayed in a process-oriented manner can be sensibly displayed via a chatbot.*" (EXP25)	
	rule-based; multiple actors	**n=7**
	"*This is the same in essence, but because costs are also involved and other organizational units may also have to be involved in the fulfillment process, there are approval steps and I would rather speak of a rule-based process.*" (EXP01)	
	"*What you would otherwise try by mail back and forth, the bot then actually takes over and controls the whole thing among all participants. [...] every one of them has a personal dialogue and the bot puts the information together, manages it, and finally sets the appointment.*" (EXP16)	
	"*[…] the request prefilled via this channel is then digitally passed on to the approver, who can then very easily say "Released." and the request will be processed further.*" (EXP28)	

Note: Counts based on the 27 interview cases

Lastly, in all of our cases (*n*=27), the participants suggest using a chatbot for the task of **information provision [U_3]** (see Table 8). Although it is always information, the kind differs between static or predefined information, unstructured or dynamic information, documents/files or links, and reminders.

For the subtask of ***static, predefined information*** (*n*=26)**,** it was mentioned that chatbots are capable of answering simple questions about different topics like technical problems or daily work-related aspects (EXP05). Chatbots should help by answering how to handle or solve these problems. Also, often mentioned was the provision of frequently asked questions (FAQ) content via the dialog of a chatbot (EXP10). These predefined and often regularly returning questions are typical questions handled by first-level service desk employees (e.g., if someone asks for "*question Q?*" give him "*answer A!*"). Besides this, chatbots are capable of inquiring about other workplace-related information for the daily work, e.g., contact persons or responsibilities (EXP20).

In the case of ***dynamic, unstructured information*** (*n*=13), chatbots should provide an interface to retrieve unstructured data in a structured way. In opposite to static or predefined information, chatbots can provide actual information, e.g., system status (EXP04). Necessary for this is a logic as well as interfaces to databases, information systems, or (web) services, which enable the provision of all kinds of information, regardless of the location in a timely manner (Exp17). This allows chatbots to optimize the current state of internet or intranet searches through a new natural language-based interface (EXP29). In doing so, present access rights must be taken into account.

As a third subtask, seven participants stated that chatbots could ***provide files/documents or links***. Thus, a chatbot is capable of providing the documents or files directly in the dialogue, and a user does not have to search for them manually in their (local) directories (EXP21). As mentioned, employees often do not know which documents they need for a specific task. A chatbot might thus be a suitable solution for this problem. Also, for example, in the case of

accounting, chatbots can provide full documents and may deliver only the relevant snippets (EXP10). Additionally, instead of providing the information in the dialog, the first support for the employees is already the provision of links to the requested resources in other systems (EXP14).

Lastly, chatbots can be used to provide ***reminders*** (*n*=2). The experts indicated that chatbots had been used for different reminders in their daily work (EXP23). Also, with their proactive capability, they can suggest automatically corresponding actions on current work tasks, like the mentioned reminders (EXP16).

Table 8 – Information provision with chatbots at digital workplaces

U_3	Information provision	n=27
Quotes	**static, predefined information**	**n=26**
	"*[…] relieve the workload by building such a service bot, which provides advice and support for all questions relating to minor technical problems and how to handle things that are really simple […].*" (EXP05)	
	"*[…] e.g., Service Desk Q&A just as it is with such a FAQ. Frequently asked questions that run through a service desk, which you could do with a chatbot.*" (EXP10)	
	"*No, only standard questions, responsibilities, contact persons, maybe something like cost centers or something like that. So first of all classic FAQ.*" (EXP20)	
	dynamic, unstructured information	**n=13**
	"*In my opinion, it could change the future [...] if unstructured data is prepared in a structured way. So what I just meant was, that you ask for system information via a chatbot e.g., Please give me the nightly disturbances from the system.*" (EXP04)	
	"*That you can quickly retrieve information via input, e.g. […] retrieve specific information about customer [...] because implementing a higher-level system that can immediately provide the information via the corresponding logics, regardless of where it is located.*" (EXP17)	
	"The Chatbot is also a relatively good contact point, for everything like information procurement with Intranet [...] currently we have tried out Chatbots to optimize something like Intranet searches." (EXP29)	
	provide files/ or documents or links	**n=7**
	"*[…] also internally there is a lot of interest to make with [chatbots]. e.g., from the accounting that one places there any inquiries and documents or excerpts from documents be returned.*" (EXP10)	
	"*And if it is only a URL call or such things. I also imagine that the chatbot can do that at the end, but not further trigger or perform [a function] [...].*" (EXP14)	
	"*[…] that you are only redirected to the search path of the PDF. Then you can download the PDF via the bot and then you can print it out.*" (EXP21)	
	reminders	**n=2**
	"*Then the chatbot [...] would either automatically create an activity or ask, "Should I set a reminder for you again? Should I create an activity for you? [...] that you should ask again, so just a follow-up appointment.*" (EXP16)	
	"*I have several Chatbot mechanisms that just help me be more productive, remind me to do things, and so on.*" (EXP23)	

Note: Counts based on the 27 interview cases

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Application Areas

As the next step in the analysis, we identified application areas of chatbots at the digital workplace (*RQ2*). As a result, our analysis revealed seven potential application areas for chatbots at digital workplaces, which can be further subdivided into divisional and cross-divisional application areas. In addition to the plain identification of these, we link them to our identified tasks (*RQ1*). In doing so, we wanted to identify necessary tasks, as requirement areas, when designing and implementing chatbots for particular application areas. Furthermore, we assessed the deployment scenario (intern vs. extern) of chatbots at the end.

Divisional Application Areas

Our participants noted four potential divisional application areas for chatbots at digital workplaces (see Table 9). In these settings, a chatbot is responsible for specific tasks or processes in a particular division.

Firstly, the participants mentioned potential application areas of chatbots in **internal and/or external support [A_1]**, e.g., service help desks in companies or customer service. This was mentioned by 22 experts. As they stated, a chatbot is a new medium for answering questions in the daily work. Thus, employees can get solutions easily for their suffered problems or answers to their issues without asking and disturbing other employees (EXP03). Besides this internal scenario, a chatbot can also enhance the external support with customers or other departments (EXP07). In this case, the goal is to reduce interruptions in service centers through the automation of answering employee as well as customer questions. Thus, the first-level support can be relieved, and they can focus on complex or major concerns. As (EXP23) noted, most of the first-level questions are like "*How do I do …?*", which can all be answered by a chatbot. Therefore, a chatbot must provide information and corresponding content to aid in the task of support in companies [U_3].

Secondly, for the case of **human resources [A_2]**, four of our participants mentioned that chatbots might support the process of job offers, e.g., to provide information on open vacancies or about the company to applicants (EXP01). Additionally, they can be used to map the whole job application process (EXP05). In this application area, we assume that it has to be possible to retrieve application relevant information [U_3] and map the whole process so that an application can be made entirely via a chatbot [U_2].

Another identified application scenario is **purchase and sales [A_3]** (n=9). Our study participants added the potentials that chatbots can be used to retrieve product information, e.g., for customer acquisition (EXP02). Besides the information provision as well as the recording of made sales, the chatbot can manage the sales or purchase process. As mentioned by (EXP17), offers can be made, which can further be transformed into real production orders by chatting with the bot. In summary, a chatbot has to be capable of delivering different kinds of content [U_3] as well as guiding through the process [U_2]. Also, it should be possible to capture emerged data and information, e.g., offers or customer data [U_1].

In addition, two experts mentioned the application of chatbots for **maintenance [A_4]**, e.g., production facilities or office supplies. It is critical to note that this corresponds strongly with physical work, which was not the focus of this research. However, some experts stated that it should be considered as a field of application, especially for the case of maintenance of office supplies at workplaces. In this case, necessary information can be retrieved through audio in-/output while carrying out maintenance tasks (EXP17). Furthermore, the chatbot ensures that the maintenance process is executed correctly, and no steps will be forgotten (EXP24). As derived from the statements, a chatbot must map the whole maintenance process [U_2] and has to provide necessary information during the tasks [U_3].

Table 9 - Divisional application areas of chatbot at digital workplaces					
Application Area		**Task**			**∑**
		T_1	**T_2**	**T_3**	
A_1	**Support (internal/external)**			✗	**22**
Quotes	"*One [chatbot] is for our [self-service portal], which is available to every employee to answer questions about the working day, not only of a technical nature.*" (EXP03) "*With the chatbot, simple customer inquiries are answered in the Service Center and customer inquiries that would otherwise end up in the Service Center are answered there.*" (EXP07) "*I used to work in one organization which probably had 150 people […] working in a call center to help employees through their HR questions. You know, 70 percent of those questions was, "how do I do …?" and actually, a chatbot is capable of responding to those questions.*" (EXP23)				
A_2	**Human resources**	✗	✗	✗	**4**
Quotes	"*[…] job offering: What is [company name]? Which jobs does [company name] offer? Who are the contact persons? Such questions are answered here.*" (EXP01) "*There is also a similar form that this [a chatbot] simplifies the application process.*" (EXP05)				
A_3	**Purchase and sales**	✗	✗	✗	**9**
Quotes	"*On the subject of sales support or in general: "How do our products actually work?" This only applies to our sales staff, which is looking for the best arguments for the (potential) customer.*" (EXP02) "*Preparing an offer [...], but of course I can also continue this afterward very well, if the offer becomes an order, I could also save myself a lot again. Perhaps by saying: "Offer XYZ has become an order".*" (EXP17)				
A_4	**Maintenance**		✗	✗	**2**
Quotes	"*[...] in the area of maintenance, [...] because specific information is needed and it would be advantageous to have your hands free. [...] So, if I can just query the [required information] by voice [...].*" (EXP17) "*[...] machine maintenance, where a user has to process checklists which are connected to the […] [backend]. There, the chatbot can guide the employee through the process and say: "Do this and that".*" (EXP24)				

Note: Counts based on the 27 interview cases

Cross-divisional Application Areas

Furthermore, our participants noted three cross-divisional application areas for chatbots at digital workplaces (see Table 10). In these settings, the chatbot makes its functions available to the employees independently of the respective department.

In our coding, we determined the application area of **(employee) self-service [A_5]**. Twenty-one participants noted application areas for this group of workplace duties. One stated application area encompasses typical tasks for the personal organization for daily work. For instance, chatbots can be used for meeting assignments, where the participants can chat with the bot to find a common date (EXP03). Additionally, other (minor) tasks that are typically addressed by self-service portals in companies represent potential application areas for chatbots (e.g., room bookings, requests of documents, as well as master data changes; EXP07, EXP23). Necessary for a chatbot in this scenario is that all of our identified tasks are addressed [U_1-U_3]. Thus, employees can retrieve the requested information, which corresponds to [A_1]. They should also execute the processes (EXP23), as well as have the option to capture or change data. Aside from this, chatbots should forward to systems if they cannot carry out the work directly or set up reminders, e.g., for upcoming tasks or appointments.

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Table 10 - Cross-divisional application areas of chatbot at digital workplaces

Application Area		Task T_1	Task T_2	Task T_3	∑
A_5	**(Employee) Self-service**	✗	✗	✗	21
Quotes	"*Things like making appointments and coordinating appointments for groups.*" (EXP02) "*[...] e.g., making room bookings via chatbots, that you can ask what's in the canteen today, that I can change my (private) address […]. That if I need any forms, like duration of employment or payslips [...] things like that.*" (EXP09) "*[…] IT Service Desks, where I can, for example, request a token for remote access or a new [employee card], etc., [...] and not only "Where can I find the holiday request?" but also cover such processes automatically […].*" (EXP16)				
A_6	**Education and training**		✗	✗	9
Quotes	"*[...] for example to let lectures run over the chatbot again. Not by a monologue, but that participants have a chatbot for repetition as a tutor, whether terms are understood correctly for example.*" (EXP21) "*[…] chatbots for employee training, that the employees can conduct such dialogs from the perspective of the provider or the customer in order to get a feeling for what the right answers are and at the same time the knowledge can be made available to the employee in a supportive way.*" (EXP27)				
A_7	**Knowledge and information management**	✗		✗	12
Quotes	"*Where one has deposited relatively much information in a knowledge portal, where then the chatbot could navigate through it or refer to corresponding functionalities [...].*" (EXP15) "*What we find quite interesting is the component of the chat, which at some point is learning in a certain way [...]. This then develops from a pure knowledge machine to a dynamic knowledge store, which is also better maintained than classic knowledge management systems.*"(EXP27)				

Note: Counts based on the 27 interview cases

Furthermore, some attendees (*n*=9) noted that they see chatbots as a new tool to support **education and training [A_6]** at workplaces. Hereby, chatbots should provide the learning content so that it can be retrieved in the dialog. For example, after product training, employees can retrieve additional information (EXP21). This corresponds narrowly to the process of information provision [A_1] as it is only about getting information. Another option for employee training is to map the optimal dialog, e.g., a customer support conversation, so employees can learn how to react optimally by taking up the different roles (EXP27). Even if the experts did not mention it directly, learning could be seen as a process where information will gradually be provided depending on the individual progress or ability to learn. Therefore, a chatbot has to provide information [U_3] and carry out the (adaptive) processes [U_2].

In addition, we found evidence in 12 interviews that chatbots are a viable tool for **knowledge or information management [A_7]**. Most of the mentions belong to the already outlined provision of information or knowledge, which are stored in large databases (EXP15). Additionally, some experts mentioned that chatbots could be used as a source of a dynamic knowledge store, where dialogs or their results are stored and been reused later, e.g., for the training of employees or documentation (EXP27). To be capable of supporting knowledge and information management, a chatbot has to deliver the requested information [U_3] as well as collect new information to expand and enhance the current state for the future [U_1]. As in total, this application area corresponds nearly with the provision of information [A_1], as one typical requirement is to provide employees with necessary information. However, this is extended by structured information storage [U_1].

Deployment Scenario

Extending this examination, we briefly wanted to rate the viable deployment scenario (internal or external) for chatbots to assess if practitioners confirm the current research projects, which focus mainly on external scenarios, e.g., customer support. Hereto, based on our pre-questionnaire (*n*=25), we surveyed this with an 11-step slider (see Figure 5; external: e.g., customer support, FAQs; internal: e.g., employee self-service, business processes). As shown, our participants mostly selected the middle position, which indicates that the application is suitable for both internal and external use cases. Therefore, our participants see both cases as a viable application area, instead of focusing only on the previously studied application of chatbots in customer support areas (external), which is contrary to the current research. What is to mention, some respondents note that an employee, e.g., from a different department, can also be regarded as external.

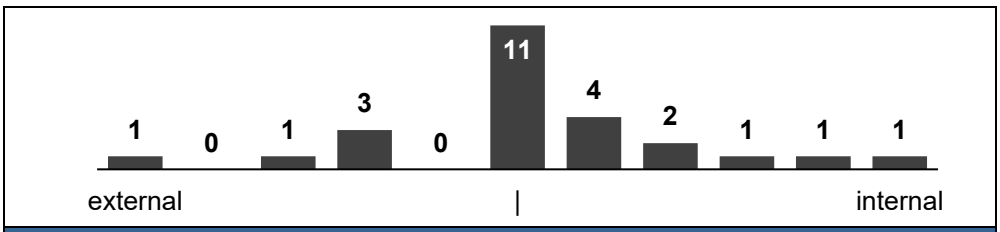

Figure 5 - Deployment scenario

Notes: Information on the basis of the pre-questionnaire; *n*=25

Objectives

As a last step in the analysis, we survey the underlying objectives of a chatbot operation at digital workplaces (*RQ3*). Therefore, we collected corresponding mentions and categorized them. Additionally, we assigned the identified objectives to main categories quality, quantity, time, or cost. Furthermore, we analyzed dependencies between the particular objectives and used them for the categorization, resulting in three levels from direct over mid-level to indirect objectives (see Figure 6).

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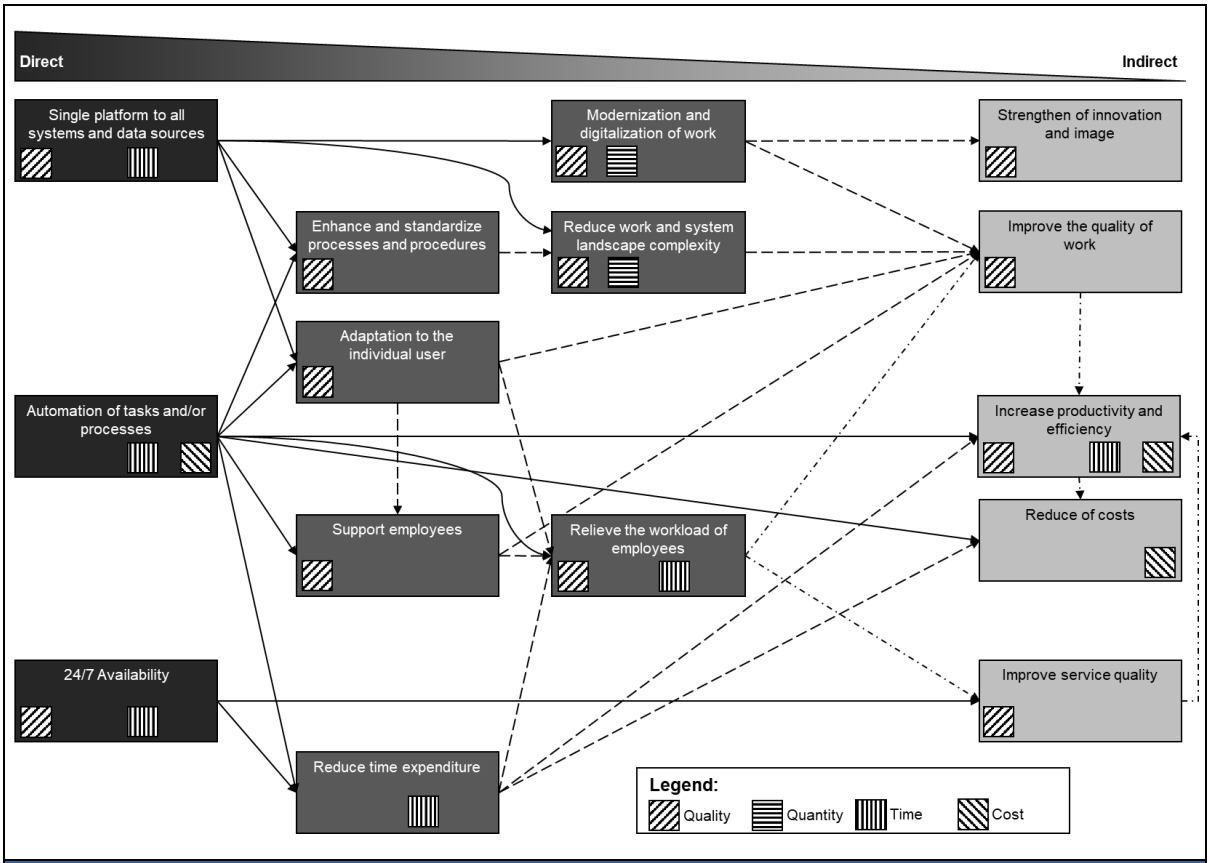

Figure 6 - Objectives and their dependencies of a chatbot operation

Direct Objectives

Based on the analysis of the dependencies illustrated above, we could identify three starting, direct objectives (see Table 11; see Figure 6: Left side, black background).

Hereby, most of our participants mentioned that they would operate a chatbot as a means of accessing available application systems (*n*=16). Thereby, a chatbot provides a **single platform to all systems and data sources [O_1]** (EXP12, EXP22). By doing this, a chatbot provides a unique entry point for different functionalities. Thus, access to these functionalities is independent of a specific device, and users do not need to install specific software. They can simply use it by expressing natural utterances.

Furthermore, chatbots should **automate tasks or processes [O_2]** (*n*=15). According to our participants, repetitive and time-consuming tasks should be chiefly taken over by the chatbot (EXP10). Extending this, automation across system borders is pursued, so that complete processes are automated instead of only single functions (EXP27).

The last identified primary objective is the **24/7 availability [O_3]** of services (*n*=11). The chatbot is always available and provides its functions regardless of date or time. Additionally, chatbots are not dependent on human resources. Therefore, they can process multiple inquiries simultaneously, which is especially valuable in rush hours, when users or employees have to wait for a support employee or help (EXP13).

Table 11 - Direct objectives		
Objectives		**n**
O_1	**Single platform to all systems and data sources**	**16**
Quotes	"*But I rather believe that channel independence in the sense that you don't have ten or twenty different apps anymore, but that you could simply say [...] "Chatbot XYZ, I have to open [...] a ticket" and then the chatbot knows which data belong into the ticket system and can query it or extract it from the statement [...].*" (EXP12) "*AI has arrived when this change between applications is no longer necessary; when I basically have one desktop and the AI knows exactly what I want to change and where.*" (EXP22)	
O_2	**Automation of tasks and/or processes**	**15**
Quotes	"*[...] tasks that are repetitive, [...] that normally take a lot of time and that can be solved faster by such a chatbot.*" (EXP10) "*In the long term, it is precisely this convenience factor that the dialog component also offers the automation of processes and process steps, especially across system boundaries.*" (EXP27)	
O_3	**24/7 Availability**	**11**
Quotes	"*Availability should be guaranteed 24 hours a day, 7 days a week for the customer.*" (EXP07) "*The possibility of parallel processing of requests is of course also very interesting for us. We have, especially in the Help Desk, certain rush hours where [...; this one] is not available [...] and I would expect [a chatbot] to be able to serve countless sessions at the same time.*" (EXP13)	

Note: Counts based on the 27 interview cases

Mid-level Objectives

Following the primary objectives, our participants noted seven mid-level objectives, which are indirectly addressed by the primary ones (see Table 12; see Figure 6: dark grey background).

Firstly, our participants noted a **modernization and digitalization of work [O_4]** (*n*=14), as available systems will be provided via natural language interfaces [O_1]. Particularly, the digital natives expect private-known technologies at the workplace (EXP01). Also, employees often want to use a natural, interactive format instead of form-based menus or classical user interfaces (EXP27).

Secondly, existing **processes and procedures should be enhanced and standardized [O_5]** (*n*=9). Due to automation [O_2], among others, the work effort should be reduced (EXP23). Additionally, process improvement is the intent by having standardized, uniform answers, and the supply of contents (EXP13).

Based on this, the **complexity of work and in the system landscape should be reduced [O_6]** (*n*=3), as only one single user interface must be used [O_1] (EXP01, EXP23). This makes it irrelevant as to whether users communicate with other employees or control enterprise systems since, for both, only the chatbot as a communication tool must be used.

Furthermore, the **adaption to the individual user [O_7]** (*n*=12) is an objective. The natural language user interface [O_1] of a chatbot is intended to establish natural communications between an employee and the application systems (EXP19). Even though it has been pursued for a long time, chatbots should achieve this by filtering and providing only actually needed information (EXP25).

In addition, the chatbot operation should **relieve the workload [O_8]** (*n*=19). By answering standard queries automatically, employees can concentrate on their actual daily tasks (EXP05). This should also make it possible to streamline work, and, thus, release human resources

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(EXP28). Thus, the employees can focus on more relevant tasks instead of just answering simple questions all day long.

Table 12 - Mid-level objectives

Objectives		n
O_4	**Modernization and digitalization of work**	**14**
Quotes	"W*hat I perceive privately in the information technology environment, that's what I would like to call contemporary and that's what I expect in my professional environment as well.*" (EXP01)	
	"*[...] Adoption to the new communication habits of the digital natives [...] All employees of the [company name] say [...] that they would rather use an interactive format, like a chatbot via different messengers, than a telephone contact, so simply the channel preference.*" (EXP27)	
O_5	**Enhance and standardize processes and procedures**	**9**
Quotes	"*[...] transparency in the processes and a certain standardization, because once a case has been solved in a certain way and the next user calls and [...] has the same problem, you can be sure that the same solution will be used again.*" (EXP13)	
	"*My feeling is that chatbots can really help simplify what is otherwise a quite complex processes.*" (EXP23)	
O_6	**Reduce work and system landscape complexity**	**3**
Quotes	"T*here are all these complex systems [...] that affect everyone in a company, and now you let the user communicate in the usual way through a chatbot, which makes it a bit less important whether it's a human or a machine. Chatbots make it possible to cope with this complexity.*" (EXP01)	
	"*A chatbot should make things less complex, it should make things easier for […] a user and the only way they will do that is, if they replace or streamline existing processes, which would include deep API connections […]*" (EXP23)	
O_7	**Adaptation to the individual user**	**12**
Quotes	"*The [form-based system] is very complicated and the chatbot is a good instrument to establish a guided rather colloquial communication in the office environment.*" (EXP19)	
	"*It is always promised that technology will adapt to us, but this is still not the case, and chatbots promise to do so because they adapt to the user and provide him with the information and use cases he needs [...]"* (EXP25)	
O_8	**Relieve the workload of employees**	**19**
Quotes	"*If the guys and girls in the IT-department don't have to worry all day about confusing calls, they can focus on more important, exciting things […]*" (EXP05)	
	"*The [chatbot project] would mean a considerable simplification for the employee but also a reduction of the effort.*" (EXP28)	
O_9	**Support employees**	**12**
Quotes	"*We want […] to support people and not replace them, and in particular the AI should not indepen-dently make decisions that are critical, but that people can still make the decisions […]*" (EXP12)	
	"*I see the commitment primarily in the support of employees at modern workplaces. [...] I think really good chatbots will react context-sensitive in the future and not on our command.*" (EXP22)	
O_{10}	**Reduce time expenditure**	**20**
Quotes	"*[...] but much more. Employees [...] come very quickly without a call, and from everywhere, to an answer by just using this chatbot. [...] So just speed as an objective.*" (EXP03)	
	"*We see the topic of response speed, where some simple requests can remain for a long time, if there is a large volume of inquiries, one is served faster here.*" (EXP27)	

Note: Counts based on the 27 interview cases

Also, **employees should be supported [O_9]** (*n*=12) in their daily work. Based, e.g., on the (partly) automation [O_2], processes are accelerated, as employees only have to make (critical) decisions (EXP12). Furthermore, the chatbot can guide a user through information acquisition by using stored structures or by refining the initial question. Thus, it provides support for users who do not know how to search, or what they are looking for, are supported in a targeted manner by the chatbot, which asks specific questions until a solution is found (EXP22). In addition, the pro-activeness supports by allowing a chatbot to independently perform or prepare actions as well as reacting to the current work situation.

As the last identified mid-level objective, we gathered the most mentions on **reducing time expenditures [O_{10}]** (*n*=20). Particularly through the automation [O_2] and using a single device-independent interface [O_1], employees can retrieve information or get help in a timely manner whenever needed (EXP03, EXP25). Additionally, since answers are not dependent on real employees, users have not to wait for response calls or e-mails.

Indirect Objectives

Following the mid-level objectives, we identified five indirect objectives (see Table 13; see Figure 6: Right side, light grey background).

Table 13 - Indirect objectives

Objectives		n
O_{11}	**Strengthen innovation and image**	**4**
Quotes	*"Because of the service quality, such a bot can also lead to the fact that the innovative power of a company is simply strengthened in order to show to the outside world in terms of market technology, yes, we are very hip with the new technologies."* (EXP11)	
	"*But the triggering impulses at the moment are actually customer loyalty, modern innovative communication channels, customer journeys, where to score positively somewhere.*" (EXP19)	
O_{12}	**Improve the quality of work**	**12**
Quotes	"*[...] support the human resources on the one hand so that they have more fun in their daily job and accordingly are naturally free for other tasks.*" (EXP12)	
	"*[...] the added value consists of establishing the control or the guidance of the dialogue flow there [...] and that in so far the chatbot provides an improvement in the working environment.*" (EXP19)	
O_{13}	**Improve service quality**	**2**
Quotes	"*[...] a chatbot is permanently accessible independent of normal working hours. This increases the quality of service.*" (EXP11)	
	"*[...] it is about a machine talking to a person and the more sophisticated the artificial intelligence behind it is, the more charming it is and ultimately it is about increasing customer satisfaction, i.e. the customer satisfaction of internal or external customers.*" (EXP26)	
O_{14}	**Increase productivity and efficiency**	**13**
Quotes	"*The fact is, we would use that to drive efficiency gains.*" (EXP09)	
	"*[...] of course a chatbot is also a real efficiency factor, if he is able to do all the work himself before a real employee has to do it and takes care of it, then you definitely have a real efficiency advantage.*" (EXP15)	
O_{15}	**Reduce costs**	**19**
Quotes	"*In such a professional call center a call answering [...] costs 8-10 Euro. If I now establish a chatbot and it takes from 10.000 tickets per month [...] 2.000 away and costs only fractions of it, then, of course, I also have this economic effect.*" (EXP08)	
	"*It is correct to speak of cost savings, but of course this is only a consequence of the whole [project; ...]*" (EXP25)	

Note: Counts based on the 27 interview cases

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Thereby, our participants mention the **strengthening of innovation and image [O_{11}]** through a chatbot operation (*n*=4). Already the provision of chatbots can increase the firm image and contribute to positive customer retention (EXP11).

Additionally, a result of the chatbot operation is the **improvement of work quality [O_{12}]** (*n*=12) by, e.g., supporting employees [O_9] or automating tasks [O_2]. This should lead to increased motivation and more time for important tasks (EXP12). However, negative effects due to work compression through decreased freedom could be possible. In general, also improvement of the working conditions is in the focus of the chatbot operation (EXP19).

Extending this, an **improved service quality [O_{13}]** is intended (*n*=2). For example, through the 24/7 availability [O_3], help is available permanently, and the company can adapt to international requirements (EXP11). Besides this, instead of searching through FAQ-pages, inquiring users can get a personal and targeted answer (EXP26).

Furthermore, the objective of chatbots is the increase in **productivity and efficiency [O_{14}]** of employees (*n*=13). Thus, the various capabilities, and previously mentioned objectives, such as automating tasks [O_2] or relieving employees [O_8], lead to increased productivity in daily work (EXP15, EXP18).

As the last and foremost goal, our participants noted **reduced costs [O_{15}]** through a chatbot operation (*n*=19). There are various savings effects, as already indicated in the previous objectives, e.g., by automating processes [O_2] or releasing capacities [O_8] (EXP08). But to mention is that cost savings are just a consequence of the operation instead of a primary objective (EXP25), which is also shown in the dependencies of objectives (see Figure 6).

Analysis of the Results

Overall, we identified three relevant usage scenarios for chatbots (see Figure 7). Although, of course, all of them are relevant, the distribution of mentions differs. Mostly, chatbots should *provide information in different kinds* [U_3] (*n*=27) as well as *execute processes* [U_2] (*n*=18). In addition, we surveyed specific application areas mentioned by our participants and identified seven potential application areas for chatbots at digital workplaces. As with the usage scenarios, all application areas can be relevant, depending on the specific case in a company. However, our experts particularly highlight chatbots in the areas of *(internal/external) support* [A_1] (*n*=22) as well as supporting the *(employee) self-service* [A_5] (*n*=21).

Furthermore, we could combine our identified usage scenarios with the application areas, based on the mentions of the experts as well as on argumentative deductive conclusions made by us. By doing this, we could highlight necessary tasks or, rather, requirements for chatbots in each of our application areas. It is worth mentioning that the *(internal/external) support* [A_1] is the most specific use case, as only tasks of content provisions are required. On the opposite, the *human resource* [A_2], *purchase and sales* [A_3], and *(employee) self-service* [A_5] are the most diversified, as all tasks can be relevant for the specific use cases. However, the *(employee) self-service* is the most mentioned application area from these three. Also, independent of the application area, chatbots always operate as a medium to provide relevant information. As we pointed out all the relevant tasks, we should note that the actual selection of addressed tasks within an application area depends on the intended use case. For example, if a company plans a chatbot just for providing information on regulations of business trips in a *self-service* [A_5] setting, probably only the *information provision* [U_3] is relevant but not the *execution of processes* [U_2] or the *collection of data* [U_1]. However, based on our findings, we can argue that chatbots can mostly be utilized for information provision along with the execution of corresponding processes, as these combinations were nearly found in all application areas.

Critical to mention on our results is that the identified application areas might not be completely selective. As indicated by the gathered data, dependencies among application areas exist. For example, the process of learning starts with querying about the learning content, which can be seen as *information management* [A_7]. The same can be seen for *maintenance* [A_4], where sometimes meetings have to be scheduled [A_5] or knowledge has to be retrieved [A_1, A_7].

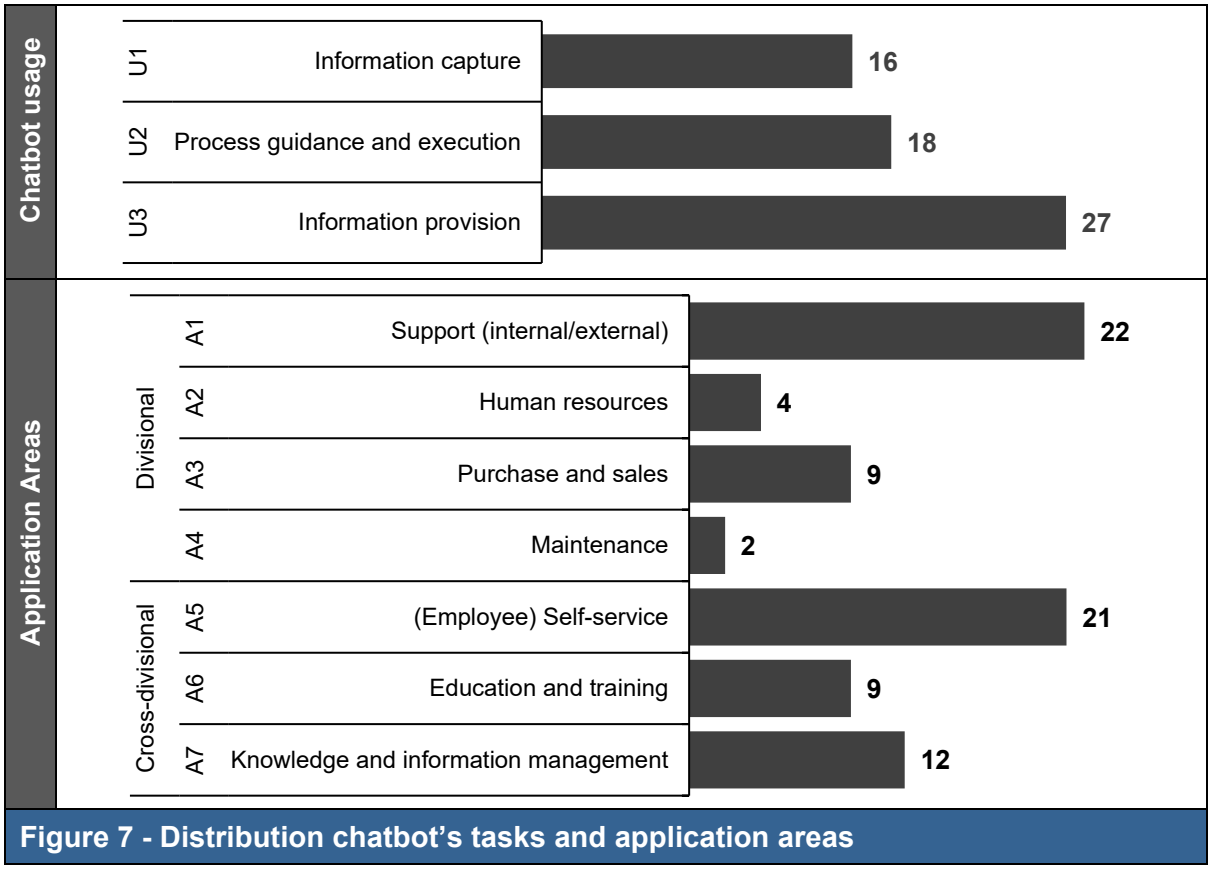

Figure 7 - Distribution chatbot's tasks and application areas

Note: Counts based on the 27 interview cases

Furthermore, we identified 15 underlying objectives of a chatbot operation at digital workplaces (see Figure 8). Extending this, we could split them into three stages from direct to indirect objectives, based on the examination of dependencies between the objectives. The main goals of chatbot application are: *unified single access to existing application systems and databases* [O_1], *automation of tasks and processes* [O_2], and *24/7 availability* [O_3]. On the other hand, *strengthening of innovation and image* [O_{11}], *increase of work quality* [O_{12}], *increase of service quality* [O_{13}], *enhanced productivity* [O_{14}], and *reduction of costs* [O_{15}] are only tackled indirectly. In the case of dependencies, we identified that the *automation of tasks and processes* [O_2] has the highest impact on other (downstream) objectives. Also, the *increase of work quality* [O_{12}] is affected by the most (upstream) objectives. This is also shown in the mapping with the objective categories (see Figure 6), as 12 objectives have an impact on quality aspects. Overall, the most mentioned objectives, and therefore the main reasons for a chatbot application, are the *reduction of time efforts* [O_{10}], *relief of employee' workload* [O_8], and *reduction of costs* [O_{15}]. To mention is that none of the most mentioned objectives is a primary or direct objective. Maybe our participants see the direct objectives as fundamental and therefore focus more on specific effects (mid-level and indirect objectives). Additionally, we could show that quality aspects are targeted most often by the objectives, followed by time aspects (see Figure 6), which underlines the aim of enhanced work and workplace quality. However, the quantity and cost category are targeted only by a few objectives.

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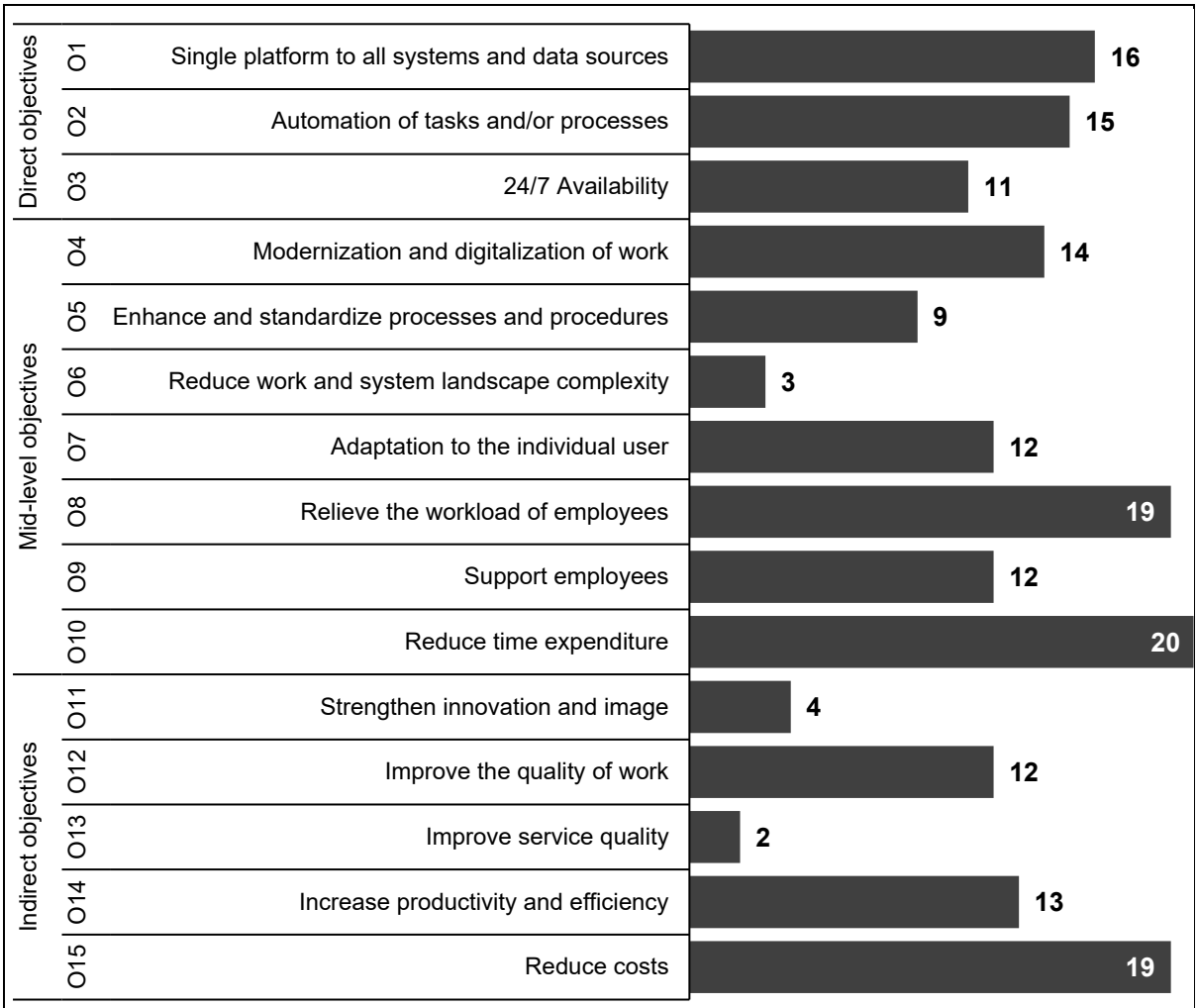

Figure 8 - Distribution of chatbot's objectives

Note: Counts based on the 27 interview cases

Lastly, we analyzed the application areas in combination with our objectives and mapped both concepts on deductive conclusions, and mentions in our transcripts (see Table 14). As seen, especially with the *(internal/external) support* [A_1] and the *(employee) self-service* [A_5], the most objectives will be pursued. Additionally, the *24/7 availability* [O_3] sets a goal for all application areas. Following that, the *increase of productivity and efficiency* [O_{14}] is relevant in nearly all application areas, except in e*ducation and training* [A_6]. The furthermost relevant objectives are the *enhancement and standardization processes and procedures* [O_5], the *relief of workload* [O_8], and the *support for employees* [O_9], which are relevant in five of seven application areas. In contrast, improved *service quality* [O_{13}] is only followed by the application of chatbots in the *support* [A_1]. This result shows analogies with the previous result of application areas and confirms the most interesting areas of use for chatbots as the *(internal/external) support* [A_1], which is the most specific, and the *(employee) self-service* [A_5], which is the most diversified, address the most of our identified objectives.

Table 14 - Mapping of application areas and objectives

Application areas		Objectives															
		O_1	O_2	O_3	O_4	O_5	O_6	O_7	O_8	O_9	O_{10}	O_{11}	O_{12}	O_{13}	O_{14}	O_{15}	
		Single platform to all systems and data sources	Automation of tasks and/or processes	24/7 Availability	Modernization and digitalization of work	Enhance and standardize processes and procedures	Reduce work and system landscape complexity	Adaptation to the individual user	Relieve the workload of employees	Support employees	Reduce time expenditure	Strengthen innovation and image	Improve the quality of work	Improve service quality	Increase productivity and efficiency	Reduce costs	**∑ Sum total**
A_1	Support (internal/external)		X	X	X	X	(X)	X	X		X	X	X	X	(X)	X	13
A_2	Human resources			X	X	X		X	X		(X)	X			(X)		8
A_3	Purchase and sales	X	X	(X)		(X)			X	X					X		7
A_4	Maintenance			X		X	X			X			X		X		6
A_5	(Employee) Self-service	X	X	X	X	X	X	X	X	X	X	X	X		X	X	14
A_6	Education and training	(X)		X	(X)			X		X		X				(X)	7
A_7	Knowledge and information management	X		X			X		X	X	X		(X)		(X)		8
	∑ Sum total	**4**	**3**	**7**	**4**	**5**	**4**	**4**	**5**	**5**	**4**	**4**	**4**	**1**	**6**	**3**	**63**

Notes: X represents that an objective can be addressed with a chatbot in the particular application area; (X) means a lesser significance of the match.

Discussion and Implications

With our study, we contribute to the existing research on application areas of chatbots at digital workplaces and the objectives of a chatbot operation. The aim of our study was to identify these based on an empirical explorative interview study with domain experts for the chatbot application at professional workplaces. In doing so, our findings show that chatbots can carry out three fundamental tasks, which are necessary for each of the seven application areas. Therefore, we could point out possible application areas and their corresponding requirements.

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Furthermore, we identified 15 objectives in three influencing stages that are to be achieved through a chatbot deployment in workplace settings.

Discussion of the results

Based on our research questions, we discuss our results of the explorative study in the following. Furthermore, we also compare our results with the scientific knowledge base and show starting points for subsequent research contributions.

RQ1: Which usage scenarios can be performed by chatbots at the digital workplace?

Even if it was only a small part of the study, we could show that chatbots can be used for information capture, process guidance, as well as information provision. Thus, our results show that chatbots are applicable in more cases than information provision, which is one of the most surveyed research areas as of now. Instead, also the information capture and the process execution seem viable use cases for chatbots. Nonetheless, information provision seems the most valuable usage scenario based on the mentions of our participants, which confirms the relevance of this research field.

Thereby, we could verify the provision of information or documents as a functional affordance of chatbots at digital workplaces, for example, as shown previously in (Stoeckli et al., 2018). Their study was conducted among mostly Swiss companies. As we confirmed their results, it can be expected that the findings are independent of a particular country or a specific cultural group but in any case for European Countries. However, as both Swiss and Germany have a similar basic cultural attitude and belong to the European area, this does not necessarily mean that the results are also valid for the rest of the world. Thus, our results can only indicate that the identified tasks could be generalizable across all countries and can, serve as a starting point for further studies. Hereto, our study or alternative approaches should be applied to other countries in order to achieve generalizable results with the help of these. As, to the best of our knowledge, this is necessary, since comparable studies exist only as in the case of (Stoeckli et al., 2018). Thus, research effort is still necessary for validating usage scenarios as we could only strengthen the research basis with German findings. However, as typically workplace tasks are similar across companies worldwide, the tasks do not differ significantly, which also supports the assumption that results are generalizable. In addition, our identified usage scenarios reflect the typical Input-Process-Output (IPO) model of application systems (Grady, 1995). This proves that a chatbot is not only a tool to provide information, but rather an application system that can support the entire data processing process. Thereby, future studies should adapt to these further interesting usage scenarios to study them in detail, instead of continuing to examine only the already extensively investigated area of information provision.

RQ2: What are the possible application areas for chatbots at digital workplaces?

One of the main aims of our research contribution was to identify possible application areas of chatbots at digital workplaces. In doing so, we identified seven viable application areas: support (internal/external), human resources, purchase and sales, maintenance, (employee) self-service, education and training, and knowledge and information management. Hereby, especially the support and the self-service state interesting application areas, as most of our participants mentioned them. Furthermore, we could combine the identified application areas with the usage scenarios. In doing so, we highlight the requirements of the respective application area, which can be used as a starting point for upcoming instantiations in a respective area.

In comparison to the state-of-the-art, e.g., as shown in (Meyer von Wolff, Hobert et al., 2019), we also identified customer support and education as an application area. However, we also

show further application scenarios that have received less to none attention by researchers so far, e.g., self-service or human resources. Therefore, as in current research contributions, the focus lies primarily on information acquisition or customer support, we could extend the current scientific knowledge base with further viable application scenarios. This is substantial, as it supports our initial assertion and verifies the relevance for the research on application areas at the digital workplace. Nonetheless, especially for information acquisition or support, as there is already a lot of research available, the corresponding previous findings should be transferred for the application domain of a digital workplace. Especially design principles or meta-research on the users' perspective are suitable since they are more likely generalizable and context-independent. As shown in the related research, e.g., the design recommendations for customer service chatbots (Gnewuch et al., 2017) or human-like response behavior (Liebrecht & van Hooijdonk, 2020) are likely to be transferred. Additionally, our results verify some of the previous contributions on (general) application areas. Hereby, we could verify the application areas information search, e.g. finding answers to questions, and work support, e.g., assisting in office tasks, of (Laumer et al., 2019) as relevant for a chatbot operation. However, since many of their use cases also represent more consumer-oriented applications, e.g., smart home, car & navigation, it must be critically examined whether all results play a role in a business area. Furthermore, we could confirm the findings of (Feng & Buxmann, 2020), who highlight chatbots for information retrieval, for routine assistance, or as a working tool. However, even if there exists a vast amount of previous knowledge in transferable areas, e.g. education or information acquisition, none of them focus on the business or professional workplace context. Thus, there should be further research on how to transfer the previous results accordingly, and, more importantly, which results are suitable for the corporate contexts. Hereby, our study provides a basis for determining which application areas can be considered, and, thus, which related research should be taken into account. However, as with the usage scenarios, our results apply for the time being only to German companies, and, thus, should be surveyed in different countries as well to verify or refuse them. Nevertheless, since no comparable studies – to the best of our knowledge – exist that target the professional workplace, we provide first research results and a good starting point for upcoming research in this area.

Additionally, as our results were examined explorative, the findings should be further verified in future research. Hereto, design science research projects could be a possible approach (Vaishnavi, Kuechler, & Petter, 2019). In doing so, based on our results, chatbots could be developed and evaluated. Another alternative could be the task-technology-fit theory (Goodhue & Thompson, 1995), or rather the fit-viability theory (Tjan, 2001). This has already been previously highlighted in (Rzepka & Berger, 2018) as a main research topic for chatbots. Hereby, the characteristics of a specific use case must be determined, which are used afterward to determine the suitability of chatbots for the respective case. In doing this, reasonable evidence to support our identified application areas can be collected.

RQ3: What are the objectives of a chatbot application at digital workplaces?

Furthermore, we analyzed the objectives of a chatbot application at a digital workplace. Hereby, our results show that in total, fifteen objectives exist, which are associated with a chatbot adoption. Thereby, a single platform to information and application systems, the automation of tasks and processes, and a 24/7 availability represent the primary objectives of the companies. In the end, chatbots should strengthen the innovation of a company, improve the quality of work and service, increase productivity, or reduce costs. In doing this, we could show a prioritization of objectives for chatbot applications at the digital workplace, and highlight which aspects are especially relevant. Additionally, we could match the objectives with our identified application areas. In doing so, we found evidence that, especially, the support and the self-service are interesting application areas since the most objectives can be addressed if a chatbot is used for this. This can also confirm the current research focus on support tasks since many objectives can be addressed by this application. However, for the task of self-

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service, where likewise, many objectives can be achieved, extensive research is missing, and should, therefore, also be promoted in the future.

Furthermore, a survey of underlying objectives has only been conducted in previous studies by (Rzepka, 2019), whereas the focus was voice assistants and not chatbots. Nonetheless, their fundamental objectives, e.g., maximize efficiency or ease of use, and minimize cognitive effort, can also be found in our results. Thus, we did fundamental research on objectives for a chatbot application at workplaces by showing a comprehensive overview of them on an organizational-level. Therefore, we could substantially provide further knowledge to the scientific knowledge base by confirming the findings of (Rzepka, 2019) for chatbot applications, and extending preliminary results of (Meyer von Wolff, Hobert et al., 2019). However, as already stated, the results are based on a German sample for the time being and, therefore, have to be transferred and validated in future studies. For this purpose, our study and the structured procedure can be adopted in order to collect the results in other countries and to check our results so that actually generalizable results are available.

Additionally, some of our identified objectives refer to concepts, which are investigated before for many other classes of systems. For example, a single point of access to business resources, was subject to research formerly, e.g., with business portals (Rahim, Suiganto, & Shameem, 2005) or (Urbach, Smolnik, & Riempp, 2010). The same applies to concepts like automation, which is, of course, not a new research stream and is today mainly considered as robot process automation (van der Aalst, Bichler, & Heinzl, 2018). Also, as some researchers state that chatbot is a means for robotic process automation (Maedche et al., 2019; Mendling, Decker, Hull, Reijers, & Weber, 2018), it would be viable for future studies to try to transfer the achieved results of this research stream.

However, besides, e.g., natural access to enterprise systems or adaptation to the individual user, many of our identified objectives are very general, and rather aspects of a digitalization strategy. Either this proves that a chatbot is a means to implement these strategies, or the participants have deviated from the actual focus. Thus, future studies are necessary to confirm our exploratory objectives, or to transfer results of digitalization research to the chatbot context. In addition, as already shown in the previous study of (Rzepka, 2019), many of the objectives can be mapped to typical constructs of UTAUT (Venkatesh, Thong, & Xu, 2016) and TAM (Davis, 1993) models, e.g., automation of tasks and processes, enhance of processes, reduce of complexity, or relieve of workload, which refers to constructs like performance or effort expectancy in UTAUT, or ease of use and usefulness of TAM. Thus, those theories should be considered when verifying or applying our identified objectives. However, since not all objectives can be mapped directly, future research should address this by establishing a new theory for chatbot applications at digital workplaces. Ideally, the theory to be created should integrate not only our objectives, but also the identified usage scenarios and application areas.

Implications for science and practice

Summarizing the findings, we could provide several contributions to both scientific knowledge and practice. For scientific knowledge and upcoming research in this area, we firstly show interesting and viable application areas of chatbots in a professional working context. In doing this, we also highlight briefly usage scenarios for which a chatbot can be applied. Due to the generalizable combination of usages and application areas, this can be used as a starting point for respective implementations in future research projects. Thus, future research should adopt these findings for their specific context or use case. Additionally, by showing comprehensive objectives of a chatbot application, we could highlight necessary characteristics for future chatbot applications and instantiations. As with the application areas, we also show that adjacent research exists, which should be transferred and reused. Overall, we could address the previously deduced research topics and agendas in chatbot research (Bawack, Wamba, & Carillo, 2019; Maedche et al., 2019; Meyer von Wolff, Hobert et al., 2019).

Hereby, we could show usage scenarios and application areas at the digital workplace that should be followed in future studies, and significant objectives for such an operation. Thus, upcoming studies can build upon our results and design corresponding chatbot instantiations in a targeted-manner taking into consideration supportive factors, like our objectives.

For practice, we point out viable application areas, in which a chatbot can be used, and should be implemented to support the employees in digital workplace settings. With this, we also establish a starting point for a requirements analysis in businesses. Additionally, we could show what effects can be expected from a chatbot operation. Hereby, we help practitioners with selection decisions when it comes to using chatbots or not. Thus, our results can be used as a guideline for chatbot projects in practice applications or for adoption decisions.

Limitation and Outlook

As with every qualitative study, there exist some potential limitations, which need to be pointed out. *Firstly*, the findings of our study are mainly dependent on the selection of interviewees and their willingness to participate as well as on their knowledge about the topic. Therefore, we carefully selected a suitable amount of experts (n=29) for (future) workplace design under consideration of chatbots and sent an information sheet in advance of the interviews. However, possible misunderstandings of the topics, as well as digressive executions from the actual context, are possible, e.g., the objectives, which are sometimes more generally for AI applications in general instead of focusing on the digital workplace. Furthermore, we have not limited the industry sector to survey a cross-section in the research area to achieve generalizable results and to weaken the impact of individual areas. Nonetheless, we could not acquire interviewees from all sectors. For instance, no participant works in machinery and plant engineering. Also, the information and communication-industry seem overrepresented in our sample. We explain this as experts from outsourced IT-departments or (exclusive) IT-business partners, e.g., for insurance or automotive, participated. Furthermore, the most limiting factor is the sample group of predominantly employees of German companies. Thus, the results apply first and foremost to this country. However, we (1) analyzed the topic independent of a specific industry based on the general professional, nowadays digitalized workplace, and (2) business processes and related basic working practices are standardized worldwide nowadays. Thus, we argue that the results are most likely generalizable. Hence, if companies want to apply chatbots, they can build upon our results as long as it concerns an application in the digital professional workplace, and as long as the application areas, which we have determined, come into consideration. Despite these limitations, our sample is still suitable to identify and survey the application of chatbots at digital workplaces. *Secondly*, it could still be possible that we have not identified all tasks or application areas, as well as all objectives. Also, the combination of tasks and application areas, as well as the deduction of dependencies between the objectives are based on argumentative deductive conclusions and mentions of the participants, which must be verified in further investigations. *Thirdly*, different researchers might interpret the coding differently. To reduce the subjective influence during analysis, we reconciled the individual findings and merged them based on discussions between the researchers.

Even though our study focused on the application of chatbots and may have some limitations, our results seem to be generalizable and transferable to specific application areas. Based on our combination of tasks and application areas, we derived potential requirement areas. As shown in (Meyer von Wolff, Hobert et al., 2019), specific requirements are still missing. Additionally, we could highlight many different objectives, which are generalizable as well. Therefore, our results can be used as a starting point for specific future chatbot implementations at a digital workplace. Hereto, practitioners, as well as researchers, can focus on our results and use the application areas and tasks as a starting point for particular requirement analysis. Moreover, based on our objectives, we could show which possible

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effects can be addressed with a chatbot. This can be considered in chatbot projects to evaluate possible outcomes. Additionally, practitioners and researchers can get more information about possible further effects than their initially intended.

Nonetheless, our combination of tasks and application areas, as well as the objectives and their dependencies, still have to be verified and may be extended in future research. Furthermore, as some experts mentioned supporting and hindering factors for a chatbot application, these should be addressed in detail in further research. Thus, we recommend focusing on specific application areas for which a subsequent requirements analysis must be performed. Building upon this, concrete chatbot projects or prototypes should be implemented to analyze effects and verify our underlying objectives. Also, supporting and, especially, hindering factors, e. g., challenges, and their solutions, should be a subject in future research. According to (Meyer von Wolff, Hobert et al., 2019), these are still open research questions of chatbot research for the digital workplace application.

Conclusion

In this research paper, we aimed at surveying relevant functions chatbots have to address at a digital workplace (*RQ1*). Furthermore, we surveyed application areas in companies in which chatbots can be beneficial (*RQ2*). To extend our contributions, we linked both of our results to determine the necessary tasks for each of our identified application scenarios. Additionally, we surveyed the underlying objectives and their dependencies (*RQ3*). As a result of our interviews with 29 experts, we identified three tasks and seven application areas – along with 16 combinations – for chatbots at digital workplaces. Furthermore, we identified 15 underlying objectives – in three stages, from direct to indirect – with many dependencies between them. Therefore, our study will contribute to both research and practice: First, the study will contribute to the knowledge base and understanding of chatbots for workplaces. Thus, this can be used for further investigations in the research area. Second, we regard our tasks as a good starting point for requirement analyses for chatbot projects at digital workplaces. Therefore, we assume that the results may help when implementing chatbots as we highlight the potentials and requirements on a general level, which can be refined for respective cases.

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