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Raphael Meyer von Wolff
Georg-August-Universität Göttingen, Deutschland

Sebastian Hobert
Georg-August-Universität Göttingen, Deutschland

Matthias Schumann
Georg-August-Universität Göttingen, Deutschland

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Sorry, I Can't Understand You! – Influencing Factors and Challenges of Chatbots at Digital Workplaces

Raphael Meyer von Wolff, Sebastian Hobert, and Matthias Schumann

University of Goettingen, Goettingen, Germany
{r.meyervonwolff; shobert, mschuma1}@uni-goettingen.de

Abstract. Chatbot research is currently on its rise since many researchers focus on this topic from different perspectives. Thereby, the focus mostly lies on application areas that originate from business contexts. However, application areas and potential outcomes are already subject to research. The business perspective on influencing factors for an application of chatbots at workplaces or their corresponding challenges is underrepresented as less to none research exists. Therefore, we targeting this research gap by an empirical cross-section interview study with 29 domain experts for the application of chatbots at the digital workplace. We categorize the findings with an extension of the TOE-Framework and show that in the core categories of technological, organizational, individual, and environmental 11 sub-influencing factors exist. Furthermore, we also identify 36 challenges, which are relevant in the particular influencing factors.

Keywords: Chatbot, Digital Workplace, Influencing Factor, Challenge

1 Introduction

Currently, a new research trend emerged: the application of chatbots, which are artificial intelligence and natural language-based human-computer interfaces, to support workers and employees in their daily work [1, 2]. This trend is driven by the current progressing digitalization of society in general and the redesign of the workplace to a digitalized future workplace in specific. Established formerly paper-based working practices vanish, and more and more innovative and digital technologies are used for current daily work tasks. Therefore, almost all working tasks of employees are affected by integrating new technologies [3–6]. As a negative consequence, through the increasing use of information systems and corresponding information sources, the acquisition of information and execution of tasks is becoming obstructed. Regardless of the spread of new and smart systems, the rising information and application overload leads to an increase in the time for searching, editing, using, and sharing of information. Instead of improving work and supporting the employees, this may affect the workers' productivity negatively [6–9]. Therefore, prior research suggests providing user-centric information systems, like chatbots, to assist employees in their daily work by automating tasks or filtering and delivering only the necessary information [1, 10]. Especially for customer service, sales, or financial advisory, these systems are already

being used to provide ease of use, faster, and high-quality services [11]. Particularly, the human-like design should contribute to a positive perception and service experience and yet offers the feeling of personal contact [12].

However, the current research mostly focuses on this topic through design research studies where artifacts are published, or their impact, on mostly single application areas, is evaluated [13]. Nonetheless, first empirical studies exist in the chatbots research domain, e.g., on trust, gender, or usability aspects. Overall, however, there is still a lot of research potential, which is due in particular to the novelty/innovativeness. In particular, the business- or management-perspective has received little or no attention so far. Especially, factors influencing or preventing adoption decisions need to be considered, as otherwise, chatbots will not be applied in business contexts, and positive results of the design studies cannot be achieved. Furthermore, the challenges of the technology should be taken into account, as these lead to efforts, which must be made during introduction and operation. Therefore, only if both influencing factors and challenges are known, they can be tackled appropriately by researchers or practice to enable and support the adoption of chatbots at digital workplaces [14]. However, to the best of our knowledge, this is so far only addressed to some extent by [15] for the insurance sector, and, therefore, a research gap for applications at the digital workplace.

Thus, as the initial adoption of chatbots is first of all a corporate decision instead of being based on individual intentions, we examine the issue at the business level [16]. Hereto, we survey the hindering or supporting factors of a chatbot application at the workplace and their underlying challenges. For this, we conducted an empirical cross-section interview study with domain experts, and use an extension of the well-established TOE-framework [14] for the categorization. In doing so, we want to assign influencing factors and challenges to the categories and assess their influences. For this research, we have oriented ourselves on the open research questions on adoption issues in [13], which are answered in the following:

> **RQ1**: *Which factors influence the adoption of chatbots at digital workplaces?*
> **RQ2**: *What challenges arise when applying chatbots at digital workplaces?*

Hereto, the remainder of this paper is structured as follows. First, we point out related research and briefly describe the theoretical framework. Second, we present our research design and corresponding findings. Afterward, we analyze our findings and discuss them. We finish the paper with the limitations and a brief conclusion.

2   Related Research

2.1   Chatbots at digital workplaces

Chatbots are a special kind of information system that uses artificial intelligence and machine learning technologies to provide a natural language human-computer interface. Often the terms, conversational agent, or personal assistant are used synonymously [2, 17]. Users can communicate by writing or speaking with a chatbot to carry out (work) tasks or acquire information. The input is processed by natural

language processing and further processed. Hereto, the chatbot is integrated with the enterprise systems or databases to provide the functionalities and information [18, 19].

Hereby, chatbots are used in different domains, like customer support or for digital workplace tasks. However, the latter is used often nowadays but not defined commonly. Besides, the by now widely established term of knowledge work is often equated with this concept [6]. Based on corresponding research, we found that the characteristics of the digital workplace are tasks on information, e.g., searching, transforming, or communicating, with a high focus on information systems. Besides, the digital workplace is often location-independent and mobile. Therefore, a digital workplace is not limited to a physical place. Instead, it is a (virtual) confluence of work tasks, processes, applications systems, or technologies, and people [5, 6, 20]. Thus, in this research, we aim at these information-intensive or knowledge work tasks instead of production-processes [21].

Since the last years, different research for the application of chatbots in the different domains was published. For example, mostly prototypes, e.g., for information acquisition [7] or customer service [22] were published. Furthermore, some researchers address more general or meta-level research on chatbots. To mention some, e.g., [23] address the conversation between humans and chatbots and derive a taxonomy of social cues, which a chatbot should encompass. Also, researchers focus on user aspects in the context of chatbots. For example, [24] survey the user experience and motivation when using chatbots and show a general acceptance for chatbots. However, they highlight the importance of handling inquiries efficiently and adequately. A slightly different approach was presented by [25] who examined factors that influence the authenticity of chatbots and, thus, influence the desired outcome like service use and quality or word of mouth. Furthermore, already some overviewing articles for application areas, technological aspects, and so on, were found in the scientific knowledge base, e.g., [2] or [26]. However, despite the different approaches analyzing single aspects, an organizational-level or rather a company-level survey of criteria influencing an application positively or disturbing is only barely studied [13]. Prior to this study, this was only carried out for the insurance sector to survey supporting or hindering adoption factors of chatbots [15]. Thus, a research gap is existent, which should be addressed in order to allow comprehensive research on countermeasures, or on how to successfully introduce chatbots in workplaces.

2.2   Theoretical Background

In today's research, different methodologies are used for the assessment of hindering or supporting factors for the application of technologies in companies. Especially the technology-organization-environment (TOE) framework by [14] has often been used to identify factors affecting adoption decisions [27]. Hereby, *technology* describes internal or external technologies relevant to the company as well as the existent IT-infrastructure [14]. The *organizational* factors, on the contrary, describe organizational measures like decision making structures, size, working cultures, or readiness for IT adoptions [28]. Lastly, the *environmental* domain is the arena in which a company conducts its business like suppliers, competitors, or the government [14]. This

framework was applied for example by [29] for assessing influencing or hindering factors of e-businesses at the firm level. Based on a survey, the authors categorized the findings along the TOE-dimensions and calculated the corresponding influence of the dimension. Especially [28] or [30] are to be highlighted, where the TOE-Framework is extended by an *individual* (I) domain. This extension covers factors of future users or decision-makers for the adoption. Thus, these influences based on the employees or rather a user are explicitly shown in order to be addressed.

In the following, we use this extended TOIE-Framework to categorize the findings. In doing so, we want to identify and assess the supporting or hindering factors of chatbot applications at digital workplaces on an business-level [16].

3 Research Design

To identify influencing factors on the adoption of chatbots at digital workplaces (*RQ1*) and underlying challenges (*RQ2*), we conducted a qualitative empirical interview study based on [31] and [32] and followed a three-step research process:

First, we selected potential interview partners. Hereto, we considered managers as domain experts who deal with the future workplace design taking into account the use of natural-language assistance systems like chatbots. To enrich the quality of the findings, the corresponding companies should at least plan to use chatbots or develop them on their own, e.g., software firms. Besides, the experts should already have at least a few years of working practice. To ensure heterogeneity and to achieve a comprehensive cross-section for the research area, we did not limit the industry sector or the company size. By doing so, we want to attain generalizable results, which can be easily reused in further research. Based on the criteria and personal contacts or internet searches, we contacted 68 experts via e-mail of whom 29 experts participated in 27 interview cases (see Table 1).

Table 1. Description of the experts who participated in the study

Case	Expert	Industry	Case	Expert	Industry
01	01	ICT	15	16	ICT
02	02	ICT	16	17	Other manufacturing
03	03	Automotive Engineering	17	18	Other services
04	04	Automotive Engineering	18	19	Finance & Insurance
05	05	ICT	19	20	Other services
06	06	Other services	20	21	ICT
07	07	Finance & Insurance	21	22	ICT
08	08	ICT	22	23	ICT
09	09	Finance & Insurance	23	24	ICT
10	10	Finance & Insurance	24	25 & 26	ICT
11	11	ICT	25	27	Other services
12	12	ICT	26	28	ICT
13	13 & 14	Pharmaceuticals	27	29	Finance & Insurance
14	15	Raw Materials			

Second, we conducted the interviews face-to-face or via conference systems during a four-month period. We used a semi-structured interview guideline as a basis to be able to leave enough room for own ideas or experts' opinions. According to the theoretical saturation [33], we stopped the process as we could not reveal new insights. The interviews were recorded and transcribed if our privacy policy was accepted.

Third, we coded and analyzed our 27 interview cases using a structured content analysis approach. Hereto, the coding was done by two researchers independently using continuous analysis of the transcripts followed by a discussion and an assignment of the codes to the core topics (*RQ1* and *RQ2*) [34]. Lastly, we used the TOIE-framework for categorization and assigned the identified factors and challenges. As the interviews were conducted in German, we translated the final coding into English while preserving the meaning.

4 Findings

Based on the described research design, we coded 597 quotes and statements for the core categories in the 27 interview case transcripts. According to the Technology-Organizational-Individual-Environment Framework of [28] and [30], we classified the influencing factors or challenges as technological, organizational, individual, and environmental. Based on the 27 cases, we identified 11 influencing factors along with corresponding 36 challenges for the adoption and operation of chatbots at digital workplaces (see Figure 1), which we describe afterward. In the following, the numbers are related to the interview cases instead of the experts. An overview of the influencing factors and the challenges, along with exemplary quotes from the interviews, is available in an online appendix at *http://bit.ly/CBInfC*.
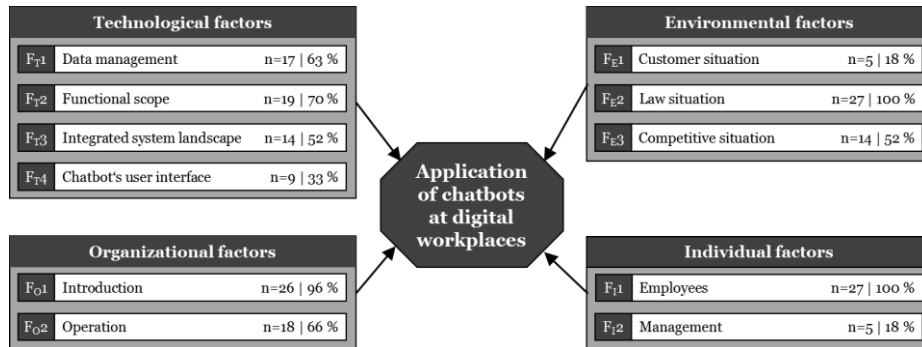

Figure 1. Identified chatbots' influencing factors (n's based on the 27 cases)

4.1 Technological Factors

We identified four technological influencing factors and corresponding challenges (see Table 4). These represent characteristics of the technology or the enterprise system landscape, which have to be considered for the adoption of chatbots.

The first influencing factor for a chatbot application is the existing **data management** [F_T1] in businesses. In particular, the participants specified that a structured knowledge and data infrastructure that can be accessed via interfaces, which are designed for natural language, is necessary so that the chatbot can use them to generate statements. However, besides these interfaces, especially the creation of the knowledge base is associated with challenges, as existing information is in an inappropriate form or even non-existing [$C_T1.1$]. Additionally, as the chatbot grows over time, further challenges arise for the continuous training and maintenance of the underlying data. Particularly in the customer support area, another challenge arises. As noted by the experts, problems exist when the chatbot statements are not coherent with the statements of real employees, e.g., when the datasets are not up to date or otherwise adulterated [$C_T1.2$]. As users only write or speak with the chatbot, they trust that the chatbot will provide correct information and may not be able to identify incorrect information. This can also refer to organizational issues and factors. Otherwise, acceptance problems or legal effects could be the consequence.

In addition to the data management, the chatbot's **functional scope** [F_T2] is also an influencing factor, which was named by most of the experts. Typically, chatbots answer questions or carry out work tasks [35]. Hereto, they must understand the natural language inputs, provide the requested functions, and execute actions correctly. Thereby, a challenge exists since currently, all conversation paths must be defined in advance [$C_T2.1$]. Despite the claim of artificial intelligence, the functionality is only as extensive as it was implemented before. Thereby, chatbots often fail with the mapping of dynamic, volatile processes [$C_T2.2$]. As a solution to be capable of this kind of conversation, usually, the perpetuation of context is recommended. However, preserving the context over several dialog changes is a challenge for current implementations [$C_T2.3$]. A further challenge arises along with the functional scope: the understanding of expressions or, rather, the localization effort [$C_T2.4$]. As mentioned by the participants, particularly in large companies, many different nationalities, languages, or even just dialects must be taken into account when designing or implementing a chatbot for the employee or customer support. Currently, a chatbot still has to be trained for every single language individually. The corresponding language understanding problems also include, e.g., synonyms or colloquial language, as well as emotions or other forms of rhetoric, e.g., irony, sarcasm.

Furthermore, we identified an **integrated system landscape** [F_T3] as necessary for a chatbot operation. In order to deliver answers or perform tasks, chatbots must access existing databases and systems. Also, chatbots must be integrated with the available information systems so that not only another system is provided. As mentioned by our experts, both of these are current challenges during implementation. First, many of the available databases or information systems have no appropriate natural language-capable interfaces to integrate the existing, often hierarchical grown, landscape with the new technology. Therefore, application programming interfaces have to be developed and also maintained during the operation of chatbots [$C_T3.1$], which becomes more critical the deeper a chatbot is to be integrated into the landscape. Second, chatbots must be integrated into the user interfaces of available information systems, i.e. that users can access the chatbot from the existing information system.

Especially for already existing communication tools, this integration must be pursued. As mentioned by some participants, they assess it as critical that a chatbot can be used through these systems [$C_T3.2$].

A last technological factor is the **chatbots' user interface** [F_T4] or respectively, their setup tools. Chatbots have to be developed, trained, and regularly improved via tools and systems dependent on the used technology or manufacturer. As quoted by the experts, these are challenges in chatbot realizations [$C_T4.1$]. Current interfaces or tools for chatbots' management are mostly accessible only to technically skilled employees – easy to use administration interfaces for non-technical employees are missing. Therefore, employees who have the best knowledge of the specific application area, e.g., support staff who has daily conversations with customers, cannot directly contribute to the necessary information, questions, or answers. Sometimes, the essential interfaces or tools are absent completely, so all of the content have to be programmed manually. Furthermore, the user interface of chatbots states a second challenge. Based on the one-dimensional characteristics of a chat dialog, it is hard to map complex processes with multidimensional paths or returns. Instead, the content that can be displayed mostly comprises (short) texts, pictures, or videos as well as some control elements [$C_T4.2$].

Table 2. Technological challenges (n's based on the 27 cases)

		Technological Challenges	*n*
F_T1	$C_T1.1$	Provision and maintenance of the required (knowledge) database	16
	$C_T1.2$	The coherence of the statements of a chatbot and real (service) employee	1
F_T2	$C_T2.1$	All (conversation-)paths must be defined in advance	4
	$C_T2.2$	Mapping of dynamic, volatile processes or conversations	8
	$C_T2.3$	Preserving the conversation context in the conversation process	5
	$C_T2.4$	Problems with language understanding and effort for language localization	11
F_T3	$C_T3.1$	Data and process integration with existing information systems and/or databases	12
	$C_T3.2$	Integration into user interfaces of existing information systems and/or interfaces	5
F_T4	$C_T4.1$	Inappropriate tools for creating and maintaining chatbots	2
	$C_T4.2$	Restrictions and limitations within the user interface	9

4.2 Organizational Factors

Our study revealed two organizational influencing factors. These represent aspects and decisions that have to be made or considered prior to the acquisition of chatbots, as well as issues to consider during a productive operation in digital workplace scenarios (see Table 3).

The first influencing factor of the organizational dimension is the successful **introduction** [F_O1]. At the time of the survey, some of the companies have not implemented a strategy or agenda taking into account the application of chatbots (in the workplace) [$C_O1.1$]. Instead, investments are made in other technologies. Therefore, the chatbot projects are often driven by single responsible persons or departments, which makes coordination among the different projects difficult and partly leads to redundant developments. Additionally, even if the potential of chatbots is often proclaimed, a missing added-value is reported [$C_O1.2$], which also affects user

acceptance as in the individual factors. Therefore, value-adding use cases must be identified beforehand [$C_O1.3$]. There is a variety of possible use cases, but not in every case, a chatbot is the best fit. Instead, classical user interfaces are sometimes a better choice. Thus, as a first step in chatbot projects, suitable use cases must be selected, e.g., as pointed out in [35] and following differentiated and defined to address beneficial tasks. Critical is that present processes often cannot be mapped one-to-one by chatbots [$C_O1.4$]. Instead, the current processes must be redefined and adjusted to the natural language user interface and the conversational operation. In addition, the scalability of chatbots is a crucial factor, which includes an easy transfer of established instantiations to new use cases as well as finding use cases where high volumes of questions are existent for the automated answering [$C_O1.5$]. Otherwise, a chatbot only causes costs instead of cost savings. Additionally, a chatbot must be customized and personalized to the application area, as well as to the individual company. Therefore, this is often a time-consuming and cost-intensive process [$C_O1.6$]. Due to this resulting expense and technological requirements, it is often not feasible for small companies. Extending this, all content the chatbot provides is mainly based on the departments' knowledge, e.g., customer support. Therefore, the department's employees, e.g., first-level support staff, are required for creating the knowledge base of the chatbot [$C_O1.7$]. However, these employees should be relieved, or rather the chatbot should take over some of their tasks. Thus, this could lead to some resistance, as employees are afraid of becoming replaceable if they contribute their knowledge completely. Lastly, it is also necessary to integrate the works council in the projects. As mentioned, obstacles can occur thereby since personal data is recorded or can be linked by the system [$C_O1.8$]. Especially the free text input is prone to entering personal or not anonymous data by mistake. Concerning this, the workers' council should be involved from the start, and agreements should be signed.

Table 3. Organizational challenges (n's based on the 27 cases)

		Organizational Challenges	n
F_O1	$C_O1.1$	Lack of an agenda for chatbots	5
	$C_O1.2$	Missing of an added-value	17
	$C_O1.3$	Definition and design of use cases	16
	$C_O1.4$	Existing (business processes) processes cannot be mapped by chatbots	2
	$C_O1.5$	Scalability of chatbots	6
	$C_O1.6$	Creating chatbots is time-consuming and cost-intensive	14
	$C_O1.7$	Generation of content for chatbots from the different departments	3
	$C_O1.8$	Obstacles by the works council	10
F_O2	$C_O2.1$	Extensive maintenance and continuous training of chatbots in the company	18
	$C_O2.2$	Missing responsibilities for chatbots	4
	$C_O2.3$	Risk of know-how loss in the company	1

As a second influencing factor, the participants noted the continuous **operation** [F_O2] of a chatbot. Hereto, our participants mentioned a high effort for continuous maintenance and training [$C_O2.1$]. This is necessary to adjust the system and to take previously unaddressed or misunderstood questions into account as shown in the technological factors. Otherwise, user acceptance or usage suffers from it. However,

automated training is also critical in this context, as there is sometimes the problem that incorrect contexts or answers are learned. Therefore, additional monitoring has to be introduced. A further challenge arises with responsibilities for the training and maintenance, which are often missing in the companies [$C_O2.2$]. The necessary steps after implementing a chatbot are not allocated probably. Sometimes these steps are outsourced, which, however, can result in dependencies or data privacy/security problems as described in the environmental factors. Lastly, as noted by one participant, the danger of knowledge loss is existent [$C_O2.3$]. If all tasks are operated only by a chatbot, no employee has the knowledge to take them over.

4.3   Individual Factors

In addition, we identified two individual influencing factors and their challenges (see Table 4). These address the future users of chatbots in a respective company, e.g., the employees, as well as the management staff who is responsible for the provision of resources.

One of the most noted influencing factors for a successful chatbot application are the **employees** [F_I1]. As pointed out by our participants, employees often have exaggerated expectations of chatbot capabilities. Mainly due to current advertisements, they assume that all possible questions could be answered [$C_I1.1$]. Despite these high expectations, we found evidence for acceptance problems for this new kind of information system [$C_I1.2$]. On the one hand, especially long-term employees do not see the benefit of an application change, because they have to adapt to new ways of working and forget the familiar. On the other hand, driven by the intended automation and relief, employees perceive chatbots as a threat to their employment [$C_I1.3$]. For all of these three challenges, it is advisable to establish change or rather expectation management. As a result of this, the added value can be demonstrated, and fears can be overcome, e.g., new duties instead of job losses. Furthermore, besides the acceptance, currently, the users lack of experience with chatbots or rather the technology behind. During acquisition, necessary components, as well as the operating principles, are unknown [$C_I1.4$]. During operation, this results in users not knowing how to work with the systems, since they only know the interaction through classic UI's. The situation is intensified by the fact that users have to adapt to the syntax and the dialog structure [$C_I1.5$]. The latter leads to a more difficult and unnecessarily longer execution time, which also harms acceptance. Some participants also mentioned emerging irritations, when chatbots are not recognizable as a chatbot [$C_I1.6$]. The last critical point is that acceptance is negatively affected when chatbots do not provide help after a certain time [$C_I1.7$]. In these cases, the inquiring person should be forwarded to a real employee.

A further individual influencing factor is the **management** [F_I2] of the respective company. Some of the participating experts criticized that the management has a sternly or inadequate assessment of the required effort [$C_I2.1$]. Instead, the assumption dominates that a chatbot can be provided without much effort. So they do not see what additional work needs to be done, e.g., an adaption of existing processes, integration into the landscape, continuous training, or necessary change management in the company. Besides, management support starts to fade after the initial investment

[$C_I2.2$]. Instead, the management is often only interested in results, which leads to no further resources being provided.

Table 4. Individual challenges (n's based on the 27 cases)

		Individual Challenges	n
F_I1	$C_I1.1$	Overestimation and high expectations of employees	15
	$C_I1.2$	Acceptance problems of users for chatbots	20
	$C_I1.3$	Fear of job loss	10
	$C_I1.4$	Lack of experience with chatbots or the technology behind	8
	$C_I1.5$	Adapt to the syntax and the dialog structure	7
	$C_I1.6$	Irritation when not recognizing chatbots immediately	5
	$C_I1.7$	Dissatisfaction due to lack of assistance	9
F_I2	$C_I2.1$	Misjudgment of the effort of chatbot projects	3
	$C_I2.2$	Loss of management support during the project	3

4.4 Environmental Factors

Lastly, we identified three environmental influencing factors and their challenges (see Table 5) for the application of chatbots at workplaces. These concerns both, customers as well as legal or competitive situations with which the company is confronted.

Our participants mentioned the **customer situation** [F_E1] of the respective company to be considered as necessary. The application of chatbots, especially in customer-oriented operations, can influence the external perception of the company. If, for example, a service chatbot breaks down and no employees are available, customer inquiries cannot be answered. Besides, the risk evolves that customers fell low esteemed by the impersonal contact over a chatbot. Both factors result in the challenge of customer loss [$C_E1.1$] as well as impersonal communication [$C_E1.2$]. Especially the external application of chatbots is critical since customers would more likely change the company as opposed to employees who would only complain internally.

In addition to the customer situation, the current **law situation** was pointed out in all interviews. Besides the protection of personal data [$C_E2.1$], the data must also be stored securely [$C_E2.2$]. This especially concerns a chatbot application in Europe, as the general data protection regulation must be considered. For proper operation, it is necessary to clarify data processing and storing as well as establish policies. A further solution is the anonymization of inputs. However, technology measures often fail to identify information worth protecting or are complex to implement. Despite all the measures, risks remain. Especially the free text input is prone to entering personal or not anonymous data by mistake, e.g., accidentally free text inputs of private or company-related information. Therefore, a current strategy is the in-house operation of chatbots. Although the data remains in the company, the question arises if a technological lead can be kept or the higher costs justify this.

The last identified influencing factor states the **competitive situation** [F_E3] of the respective company. Most experts pointed out an innovation pressure for chatbots caused by the current hype about artificial intelligence technologies in general and of first-level support chatbots in specific [$C_E3.1$]. Often, chatbot projects are just wanted or implemented without a suitable use case. Instead, the focus lies only on keeping up

with competitors. In addition, dependencies with chatbot providers arise [$C_E3.2$]. Companies struggle with the selection of an appropriate provider. Besides choosing an interface that is used by the users, companies must select a corresponding long-term provider. Critical here is that the selection is difficult to undo since current chatbot instantiations cannot be easily transferred to another provider or a different chatbot platform. Especially, since it is unclear which suppliers will be active in the long-term.

Table 5. Environmental challenges (n's based on the 27 cases)

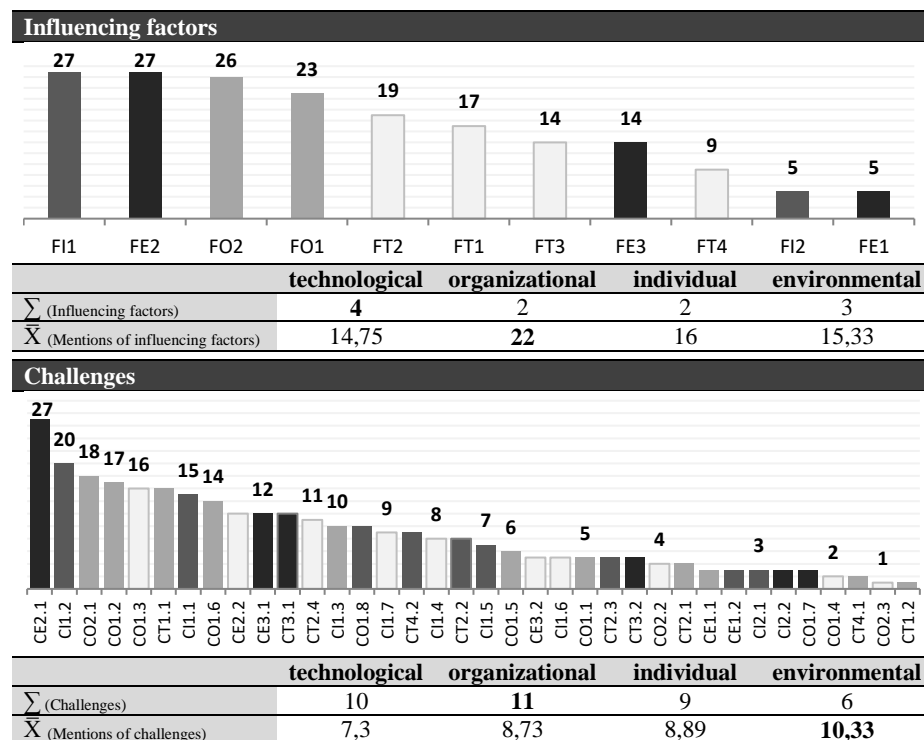|		Environmental Challenges	*n*
F_E1	$C_E1.1$	Loss of customers	3
	$C_E1.2$	Impersonal customer contact	3
F_E2	$C_E2.1$	Ensuring data protection (concerning GDPR)	27
	$C_E2.2$	Ensuring data security	12
F_E3	$C_E3.1$	Innovation pressure to use chatbots	12
	$C_E3.2$	Dependencies on the provider of chatbot technology	5

5 Analysis and Discussion

Our findings imply that there exist many influencing factors and challenges, corresponding to the TOIE-Framework by [28] when applying chatbots at digital workplace settings. This also underlines the capability of the TOIE-framework for identifying influencing factors and challenges on a business level. Furthermore, although the primary goal was a qualitative study to identify factors and challenges that influence adoption, we have extended the results quantitatively based on the 27 interview cases to assess their influences. This helps in identifying critical factors, which should be addressed as well as in prioritizing countermeasures. Hereto, we summed up the unique number of cases in which they were mentioned.

Overall, we identified 11 influencing factors (see Table 6). Mostly, in all cases (*n*=27) the *employees* [F_I1] and the *law situation* [F_E2] were noted followed by 26 cases who stated the *introduction and operation* [F_O2] as critical for a successful chatbot application. The *management* [F_I2] and the *customer situation* [F_E1] cause less impact, as mentioned by only 5 experts. The technological influencing factors are mentioned moderately by 9 to 19 experts. In addition, we surveyed challenges, which are existent in each influencing factor, and identified 36 of them. Hereby, mostly the challenge of *ensuring data protection* [$C_E2.1$], especially under consideration of GDPR, was named in all of the cases. The subsequently named challenges are *acceptance problems* [$C_I1.2$] (*n*=20), *extensive maintenance and continuous training of chatbots* [$C_O2.1$] (*n*=18), and a *missing benefit* [$C_O1.2$] (*n*=17). The first technological challenge, the p*rovision and maintenance of the required (knowledge) database* [$C_T1.1$], is named in the fifth place by 16 experts. The least named challenges are *inappropriate tools for creating and maintaining chatbots* [$C_T4.1$] and *existing (business) processes that are not aligned to chatb*ots [$C_O1.4$] in two cases, as well as *the coherence of the statements of a chatbot and real employees* [$C_T1.2$] and *risks of know-how loss* [$C_O2.3$] in one case. Thus, two technological challenges are among these, which support the hypothesis that technical aspects are not the problem when applying or operating chatbots in businesses.

Furthermore, mostly technological influencing factors are named (see Table 6). This indicates that currently, technical aspects are present, or the focus lies on them. In the case of the mean of mentions, however, the organizational influencing factors are mentioned much more frequently (*mean*=22). Whereas, the technological factors are the least named (*mean*=14,75). This distribution is also recognizable for the challenges: Besides the organizational challenges, which are 11 in total, 10 technological challenges where identified. However, on average, our experts mostly stated environmental challenges (*mean*=10,33) followed by individual challenges (*mean*=8,89). Therefore, we conclude that: (1) In the case of influencing factors, mostly the organizational factors must be taken into account when applying chatbots in workplaces settings. (2) In the case of challenges, mostly environmental challenges must be considered and addressed to enable a purposeful application of chatbots. (3) In summary, although chatbots are a technology, there are rather organizational, external, or individual aspects, which should be considered foremost. Nonetheless, as we value the influence based on the number of mentions, this does not necessarily mean that the others are not critical. Instead, they also have the potential to be a showstopper and must be taken into account likewise.

Table 6. Distributions of influencing factors and challenges

Influencing factors				
	technological	**organizational**	**individual**	**environmental**
$\sum$ (Influencing factors)	**4**	2	2	3
$\overline{X}$ (Mentions of influencing factors)	14,75	**22**	16	15,33

Challenges				
	technological	**organizational**	**individual**	**environmental**
$\sum$ (Challenges)	10	**11**	9	6
$\overline{X}$ (Mentions of challenges)	7,3	8,73	8,89	**10,33**

Thus, the results of the study affirmed our initial assumption that the research community should switch from chatbot design research to rather an organizational or

management view. As shown, technical aspects are mentioned less. On the contrary, organizational and individual issues have the highest influence on adoption decisions, as well as environmental or individual challenges. Nonetheless, as the design research perspective is often pursued and the identified factors influence individual design decisions, our results should be included in future design research studies for chatbots in business applications. In doing so, possible challenges can be addressed and the corresponding effects can be reduced early in the design stage or in design studies. Additionally, it is also noticeable that many classic IT influencing factors or challenges also apply in particular for chatbot applications at digital workplaces, e.g., data protection, user acceptance, or maintenance and support of the systems.

Furthermore, we could find some clues that related research can be verified by our findings. At first, our study verifies the high influence of the user on introduction and operation. Secondly, we could derive high expectations of the users, which were hinted in [36] or [37]. Additionally, [38] show that environmental and individual factors have a high relevance on adoption decisions, which we were also able to show. Thus, we could contribute that users and usability factors have a high influence on the adoption of chatbots in workplace settings. Although chatbots are technically easy to set up, the major effort concerns the design of social and human aspects to enable an intuitive and natural usage behavior. Also, from a theoretical perspective, many of our individual factors, e.g., *overestimation and high expectation* $[C_I1.1]$, or *lack of experience* $[C_I1.4]$, can be mapped to the core constructs of technology acceptance and their theories, e.g., TAM or UTAUT [39, 40]. Thus, future studies could pursue these approaches in detail. Also, general aspects of system quality were mentioned, e.g., the *syntax* $[C_I1.5]$ or *security* $[C_E2.1, C_E2.2.]$, which is consistent with IS success research and underlines the importance of these characteristics during chatbot application [41]. In comparison to previous results focusing the environmental issues, we also show that especially data protection and data security are challenging factors when applying chatbots at digital workplaces, e.g., [42]. As this category is also our most noted challenge factor, future studies should focus more on these issues. Especially in comparison to the study of [15], we enrich the knowledge base with specific and comprehensive specifications of influencing factors and their respective challenges for the workplace domain. Furthermore, we could verify the artificial intelligence research agenda of [43], who already pointed out people, (inter-)organizational and societal issues, as relevant for future research.

6　　Conclusion and Limitations

In this research paper, we survey influencing factors (*RQ1*) and challenges (*RQ2*) for the application of chatbots at digital workplaces. Based on the TOIE-Framework, we identified technical, organizational, individual, and environmental influencing factors and challenges. As our results indicate, the participants note mostly the organizational influencing factors as opposed to the challenges, where mostly the external ones were mentioned. Comprehensively, we show that despite chatbots are a (new) technology, mostly the non-technical aspects should be taken into account.

However, as with every qualitative study, there exist some limitations, which have to be outlined. *First*, the findings and results are significantly dependent on the interviewee selection and their willingness to participate and provide insights into their experiences. We minimized this influence by: (1) Including a suitably large set of participants with knowledge for the application of chatbots at digital workplaces. (2) Taking into account a cross-section of the industry to achieve generalizable results and to weaken the impact of individual areas. However, our sample consists predominantly of German participants. *Second*, the primary goal was a qualitative study. Nonetheless, we also did some quantitative evaluations based on our interviews. As these sums are only based on our sample, the findings are not representative. Hence, the distribution can be seen as a first indicator of a weighting of factors and challenges when applying chatbots at digital workplaces. *Third*, different researchers might interpret the findings differently. Hereto, we analyzed the interviews by two researchers independently followed by a discussion between them where the findings were merged.

Despite these limitations, our results seem to be comprehensive and generalizable. Thus, with our findings, we contribute to both, research and practice. For the scientific community, firstly, we close the existent research gap for influencing factors and challenges surrounding the chatbot application at digital workplaces. Secondly, we confirm the previous results in this research topic and extend them through our comprehensive survey. Furthermore, we show that especially organizational or management, as well as environmental topics, should be followed in future research. These topics have been given less consideration to date, and our assessment confirms the importance of the factors. For the practice community, we point out comprehensively influencing factors and challenges. Companies can use them for a successful chatbot application. Second, with our influencing factors, decision-makers can prioritize their tasks and address them based on our descriptions and the weighting. Nonetheless, the results still have the potential to be verified on a larger scale, e.g. internationally or in other industries.

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