

Chatting for Change: A Design Science Study into Crafting a Chatbot System for Corporate Sustainability

Lisa Schrade-Grytsenko
FernUniversität Hagen
lisa.schrade-grytsenko@fernuni-hagen.de

Ulvi Ibrahimli
Julius-Maximilians-Universität
Würzburg
ulvi.ibrahimli@uni-wuerzburg.de

Karolin Eva Kappler
Katholische Hochschule Nordrhein-
Westfalen
k.kappler@katho-nrw.de

Alina Bockschecker
FernUniversität Hagen
alina.bockschecker@fernuni-hagen.de

Stefan Smolnik
FernUniversität Hagen
stefan.smolnik@fernuni-hagen.de

Axel Winkelmann
Julius-Maximilians-Universität
Würzburg
axel.winkelmann@uni-wuerzburg.de

Abstract

Conversational agents (CAs) are emerging as valuable information system artifacts with the potential to drive sustainability practices within corporate environments. Despite the growing significance of corporate sustainability the systematic integration of CAs in this domain remains largely unexplored. Addressing this gap, our study employs a design science research approach to explore how CAs can be designed to support sustainable corporate behavior through the lens of the Fogg behavior model. Using a pre-study, literature review, and a series of interviews, we derive meta-requirements, design principles, and a conceptual framework to guide the development of sustainability-oriented chatbots. Our findings contribute to information systems research by advancing knowledge on socio-technical system design and IS-enabled sustainable practices. By providing prescriptive insights, we highlight how chatbots can shape employee behavior, reinforcing their potential as enablers of corporate sustainability.

Keywords: Conversational agent, corporate sustainability, chatbot system, design science.

1. Introduction

First introduced in the 1960s, the concept of conversational agents (CA) has ever since been subject to ongoing research (Gnewuch et al., 2017; Janssen et al., 2020; Maedche et al., 2019). This development is propelled by the emergence and integration of artificial intelligence (AI) technologies in digital assistance (Wang et al., 2022). The co-occurrence of such technologies affects our daily interactions as well as our professional and personal lives (Adamopoulou

& Moussiades, 2020; Janssen et al., 2020). For instance, CAs like Alexa, Siri, or Cortana are designed to support users in a myriad of daily tasks, ranging from calendar management and information retrieval to facilitating shopping on virtual marketplaces (Gnewuch et al., 2017; Jain et al., 2018; Janssen et al., 2020). Their utility extends beyond personal use to corporate settings due to their potential to enhance productivity and curtail service costs (Adam et al., 2021; Adamopoulou & Moussiades, 2020; Reshmi & Balakrishnan, 2018). A promising application area of CAs is the integration into the sustainability actions of companies (Dolgui et al., 2021; Rusch et al., 2021). The field of application is mainly untapped, although the significance of sustainability is extensively documented, and its demand continues to surge (Gurcan et al., 2023; White et al., 2019). The realization of sustainable development hinges on the dedication of individuals and organizations alike, with companies positioned as influential drivers of such change (Elliot, 2011; Tussyadiah & Miller, 2019). Nevertheless, such changes demand practical implementation approaches. One emerging CA that may serve as a pragmatic solution is chatbots. In a business context, different use cases include, inter alia, customer service, sales, and marketing, yet they also have the potential to support climate-friendly employee behavior and operations (Hillebrand & Johannsen, 2021). The use of chatbots in a corporate context to assist employees is auspicious, as employees' behavior can positively or negatively influence the achievement of corporate goals, also with regard to sustainability (Gabcanová, 2011; Morschheuser et al., 2022; Zhenjing et al., 2022). Despite sporadic instances of chatbots supporting sustainability, there is a lack of a systematic approach in the current research landscape that provides sound

design knowledge about how such chatbots need to be designed for use in a corporate sustainability (CS) context (Chaves & Gerosa, 2020; Dolgui et al., 2021; Rusch et al., 2021; Wache et al., 2022). The call for continuous research on the design of such chatbots is prevalent (Feine et al., 2020; Følstad et al., 2019). In response to those calls, our study aims to elicit the design principles (DPs) and implications of such chatbots. Thus, the research question (RQ) driving this inquiry is: *RQ: How should a chatbot be designed to support corporate sustainability?*

For this purpose, we adopt the design science research (DSR) approach according to Hevner et al. (2004) in line with Peffers et al. (2008) to answer the research question. By that, our study contributes to sustainability and information systems (IS) research by advancing the scholarly discussion on understanding and analyzing human behavior in a CS context and highlighting the role of IS as enablers of sustainable practices. It also extends the cumulative knowledge of socio-technical system design by offering prescriptive knowledge on designing CAs to trigger specific behavior patterns. In the following, we present the theoretical basis, research design, and findings in the form of our meta-requirements (MRs), DPs, and framework for such a chatbot.

2. Related work

2.1. Corporate sustainability

The fundamental idea behind sustainability involves avoiding the production or consumption of resources beyond their capacity for regeneration while also considering future needs (Eckhardt, 2020; World Commission on Environment Development Brundtland, Gro Harlem, 1991). In a holistic approach based on the triple bottom line model (TBL), ecological as well as social and economic components of sustainability must be considered (Elkington, 1999). In this work, we focus mainly on the ecological aspect of sustainability. To fulfill crucial sustainability goals, numerous substantial measures and legally enforceable agreements have been instituted at both the national and international levels, including initiatives like the Sustainable Development Goals (SDGs) and the Paris Agreement (United Nations, 2015; United Nations / Framework Convention on Climate Change, United Nations, 2015). Companies play a crucial role as stakeholders in the attainment of sustainability objectives (Chen et al., 2021; George & Schillebeeckx, 2022; United Nations, Department of Economic & Affairs, 2020). In the realm of corporate sustainability (CS), these overarching sustainability principles find practical application within a corporate

context. The prevailing approach to CS entails “[...] meeting the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well.” (Dyllick & Hockerts, 2002, p.131). A company can act sustainably by implementing measures, such as actions towards resource efficiency, energy savings, or responsible treatment of employees throughout the whole supply chain (Chernikova et al., 2020; Umarusman & Haciveliogullari, 2021; Volpato et al., 2019). For instance, resource efficiency is an approach that involves the prudent utilization of a company's essential resources, such as water, energy, and raw materials, resulting in ecological sustainability (Chernikova et al., 2020; Huysman et al., 2015). Employees are an essential part of the company as they are the operating and implementing force, with their behavior influencing the company goals and overall constitution, also in terms of the company’s sustainability performance (Gabcanová, 2011; Morschheuser et al., 2022; Zhenjing et al., 2022). Factors determining such sustainable behavior are the intention to behave sustainably, the employees' attitude toward sustainability, as well as their motivation and overall ability to act sustainably (Feng et al., 2024; Lülfs & Hahn, 2014; Sabbir & Taufique, 2021). In our study, we focus on the employee as the performer of corporate tasks that, in turn, are supposed to contribute to CS, as mentioned in the examples above. The employee is also the intended user of the artifact to be designed in our research.

2.2. Conversational agents

CA, also known as chatbots, refers to intelligent systems capable of processing and reacting to users’ input prompts using natural language (Cameron et al., 2017; Gnewuch et al., 2017; Tavanpour et al., 2019). Previously, CAs could merely simulate naïve responses based on matching a user’s input against a set of stored patterns (Cameron et al., 2017; Gnewuch et al., 2017). In essence, they were mainly designed to pass the Turing test (Abu Shawar & Atwell, 2007; Gnewuch et al., 2017; Shah et al., 2016). Their capabilities have vastly evolved in recent years owing to advances in AI, particularly natural language processing and machine learning (Berg, 2015; Gnewuch et al., 2017; Knijnenburg & Willemssen, 2016). Yet, ensuring a smooth user experience in such settings can be challenging (Stein et al., 2024; van der Goot et al., 2021). A growing body of research on customer service chatbots highlights that user satisfaction is primarily influenced by factors such as

the chatbot's effectiveness in resolving user issues, the relevance of its responses, and the conciseness and clarity of its output in relation to the given prompt (Kvale et al., 2021; Stein et al., 2024; van der Goot et al., 2021). In contrast, mistakes and limited functionality can quickly diminish satisfaction levels (Stein et al., 2024; van der Goot et al., 2021). Additionally, studies on CAs in organizational settings suggest that the adoption of CAs is influenced by individual user traits, particularly their level of technological proficiency (Gkinko & Elbanna, 2023; Stein et al., 2024). Likewise, the effectiveness of CAs is also dependent on the specific use case and intended purpose (Hillebrand & Johannsen, 2021). CAs have found applications in various sectors, including e-government, education, and healthcare (Chung & Park, 2019; Cortés-Cediel et al., 2023; Pérez et al., 2020). Additionally, chatbot systems are gaining attention for their potential to enhance internal organizational processes (Stein et al., 2024; Tavanpour et al., 2019). Yet, the research on such IS has not availed itself of the recent sustainability movement in the corporate context. Despite a few notable exceptions, design science in IS research has largely neglected the use of IS artifacts for advancing CS goals (Hillebrand & Johannsen, 2021). In the following, we refer to a chatbot system when referring to the overall IS-based system and to a chatbot when referring to it through a user's lens.

2.3. Fogg behavior model for persuasive design

To develop a chatbot that effectively facilitates a target behavior, it is crucial to gain a comprehensive understanding of the underlying mechanism when it comes to behavior and behavior change persuasively, especially when designing IS for sustainability (Kimura & Nakajima, 2011; Mustaqim & Nyström, 2014). The Fogg Behavior Model (FBM), developed in 2009, offers a systematic view to support researchers' and designers' understanding of behavior and envisioned change toward a target behavior when developing (persuasive) technology (Fogg, 2009). While traditional theories like Behaviorism focus on environmental reinforcement, and Social Cognitive Theory emphasizes observation, the FBM is ideal for CS because its clear motivation, ability, and trigger framework simplifies understanding how to design for specific, incremental behavioral changes by reducing effort and leveraging opportune moments, making it practical for complex, long-term sustainability changes (Bandura, 1986; Skinner, 1953). Figure 1 outlines the general mechanism of the FBM. For a target behavior to occur, it must concurrently fulfill

three factors: motivation, ability, and triggers (Fogg, 2009). Motivation to perform a particular task and the ability to do so are as necessary as the enabling trigger in the form of a prompt (Tsai et al., 2015). Motivation for a specific behavior can range from low to high and is influenced by factors targeting the dimensions of pleasure and pain, hope and fear, as well as social acceptance and rejection (Coker, 2017; DeWall et al., 2008; Fogg, 2009; Leknes & Tracey, 2008; Siivonen et al., 2024). Depending on the task and the person performing it, motivation, as well as ability, may be higher or lower, making the task more difficult or more straightforward to achieve. Generally, the baseline for both factors is not at the extreme high or low, meaning a mediocre level of either motivation or ability that needs to be triggered further (Fogg, 2009). The goal is to reach a motivation-ability level above the activation threshold (see Figure 1) to increase the likelihood of the target behavior or achievement of the task. This requires three different types of triggers. Spark triggers are used to enhance motivation when users are generally able to complete the task. It can be achieved by showing users fear or hope by triggering videos or texts, or using gamification elements like levels, achievements, or leaderboards, which are proven to increase users' motivation for IS use (Blohm & Leimeister, 2013; Schöbel et al., 2020; Thiebes et al., 2014). To enhance the ability of a generally motivated person to reach a target behavior, facilitator triggers are used. When designed effectively, these insinuate to the user that the task is easy to fulfill. Facilitators can reach simplicity by addressing six elements: time, money, physical effort, brain cycles, social deviance, and (non-)routine.

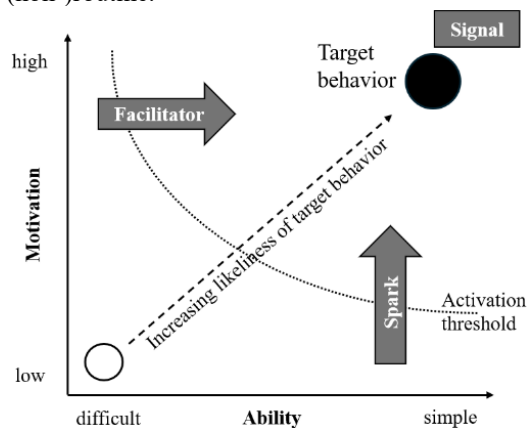


Figure 1. FBM, adaptation of Fogg (2009) and Tsai et al. (2015)

The last trigger, the signal, is used when users show sufficient levels of motivation and ability and simply need to be reminded to fulfill the task. This is comparable to waiting at a red traffic light: the ability (car, driving license, etc.) and motivation (to drive

further and not park the car at the traffic light) are generally given, but the green light is needed to proceed the task (Fogg, 2009).

To support CS, the employee's behavior is the target of this study. Therefore, we divided them into three user groups (UG) according to the corresponding trigger types: the “motivated but struggling” who need a facilitator trigger (UG 1), the “motivation seeker” who needs a spark trigger (UG 2), and the “signal receiver” who awaits a signal trigger (UG 3). As mentioned earlier, the target behavior can emerge as a task to be fulfilled (Fogg, 2009). This makes the model very applicable to both the corporate and behavioral context, as employees mostly encounter tasks in their corporate work, and their fulfillment relies on the employees' tasks supporting or counterproductive behavior, also in terms of sustainable behavior (Fogg, 2009; Steininger, 2025; Tan & Sarif, 2024; Zhenjing et al., 2022). In the following, we use the FBM to structure the relevant knowledge from the current literature and then derive meta-requirements (MR) and associated DPs.¹

3. Research approach

Our study aims to design a chatbot system as an IS artifact that supports employees in behaving more sustainably within their corporate context. We follow the DRS approach, according to Hevner et al. (2004), in line with Peffers et al. (2008), as an overarching methodology and a special focus on a rigorous evaluation, according to Sonnenberg and vom Brocke (2012). This approach combines a nominal research process with a focus on developing system requirements to address an organizational problem. It includes six steps through an iterative process: problem definition, solution objectives, design and development, demonstration, evaluation, and communication. To ensure the validity of our outcome and the usefulness of our artifact, we structured our building and evaluation process according to Sonnenberg and vom Brocke (2012).

Our problem definition stems from a priorly conducted literature review that was enriched with a Delphi study (Diamond et al., 2014; Okoli, 2015; Okoli & Pawlowski, 2004; Rowe & Wright, 2001; Skinner et al., 2015). This served as input knowledge to develop an understanding and awareness of the problem (Schrade-Grytsenko et al., 2022; Schrade-Grytsenko et al., 2025). Our solution space is rooted in combining efforts to trigger a target behavior towards more CS on the employee level through the use of a

¹ Please find a distinction of MR and DP assignments here:

chatbot. We use the FBM as a conceptual background to derive factors that trigger the envisioned target behavior (Fogg, 2009). Drawing on that, we derived MRs, DPs, and features (DFs) that inform the design of a chatbot system that, in turn, acts as a trigger to facilitate the target behavior. The literature on (the design of) CA, CS, and FBM served as input knowledge that informed the initial delineation of MRs for the chatbot. In our second evaluation round, we conducted six semi-structured qualitative interviews with three target groups, similar to our Delphi panel structure, to evaluate the MRs, DPs, and the resulting framework. Table 1 summarizes the interview participants' code assignments and backgrounds.

Table 1. Information on evaluation interviews

Code	Background of the interview partner
I1	Social sciences scholar and professor for digitalization
I2	Post-doc with extensive DSR experience
I3	CTO with extensive corporate IT expertise
I4	PhD student in IS with extensive DSR experience
I5	CEO with extensive experience in corporate environments
I6	Junior software developer with experience in chatbot development

We consulted with behavioral science and IS researchers to assess the logical pathway and rigor of the framework through a theoretical lens. Second, we interviewed potential users from companies to evaluate the effectiveness and usefulness of our chatbot, which includes understanding the performance and envisaged utility of our chatbot in the real organizational context and supporting CS. The interviews served to refine the set of MRs and DPs. The abstracted DPs, combined with the trigger dimensions, lay the groundwork for our framework for a chatbot supporting employees' sustainable behavior (CA-CS design framework). The interviews followed up with the collection of feedback on our framework in line with Sonnenberg and vom Brocke (2012). Subsequently, we revised the framework based on the input received and undertook further refinements to craft the final design of the framework. This serves as the basis for the prototype, the next step in our research project. Finally, we communicate by disseminating our preliminary results to the IS community.

<https://doi.org/10.0.92.176/b2share.dce6fd58efe0446c90b19920a54fbc1e>

4. Designing a chatbot for corporate sustainability

4.1. Meta-requirements

Initially, the chatbot system must maintain principal functionalities. It requires a dialog system embedding information using a generative encoder-decoder module (Zhao et al., 2017). This is, on the one hand, necessary for recognition of the users' language of sustainability and intent (**MR1**), on the other hand, also for delivering an answer that matches the input semantics to serve the objective of the conversation (**MR2**) (Ghose & Barua, 2013; Salomonson et al., 2013). Further, it should respond sensitively to the specific sustainability concerns of the user (**MR3**) and provide actionable prompts to users in a non-intrusive manner, ensuring ease of execution and engagement (**MR4**) (Gu et al., 2021; Hillebrand & Johannsen, 2021; Liu & Sundar, 2018). To enable relevant workplace-specific contextualization of the chatbot interaction, it should be connected to the target organizational systems (**MR5**) (Cho et al., 2024; Kumar, 2024).

It should have a regularly updating repository of sustainability data (**MR6**) so that output is continuously adjusted in line with the latest sustainability trends (Ed-douibi et al., 2021). The chatbot should also adjust the user proficiency level on sustainability and support the temporal knowledge development of the user based on the continuity of the conversation (**MR7**) (Jia, 2009). At the same time, it should gradually add new knowledge to expand the knowledge base (**MR8**) (Mazumder et al., 2018). It is also necessary to regularly remind users to take action through low-effort prompts (**MR9**), that is, concise, jargon-free, in plain language (Todd & Benbasat, 1992). After a prompt, the bot could include a quick feedback mechanism (**MR10**) asking whether the action was taken or if the user found the suggestion helpful (Yin et al., 2024). Additionally, the chatbot system needs an analytics module (**MR11**) to normalize, aggregate, and analyze the data for individual sustainability performance tracking (Ali et al., 2023). To foster such performance, motivation, and engagement, the chatbot system can incorporate sustainability-related gamification elements (**MR12**), such as levels, achievements, or leaderboards, which are proven to increase users' motivation of IS use (IS) (Hidayatulloh et al., 2021; Schöbel et al., 2020; Thiebes et al., 2014; Blohm and Leimeister, 2013). Moreover, it should provide an inclusive environment and cater to users with special needs (e.g., reading disability) (**MR13**) such that it supports multiple

interaction modes (Stanley et al., 2021). Lastly, to foster trust and transparent interaction with the chatbot, it is vital to provide the rationale behind the recommendations (**MR14**) by showing positive externalities of corporate sustainable behavior (Zhang et al., 2023; Huynh, 2024).

4.2. Design principles

We synthesized the meta-requirements from the literature and Delphi study and derived DPs, which we evaluated in six interviews (I1-I6). To develop DPs, we recombined various requirements. The outcome was then assigned to the FBM prompts to understand how chatbot design serves behavioral triggers. **DP1: Semantic adaptivity.** The chatbot system should generally be able to recognize the user (I2), understand the intent, and serve as a context-aware agent to ensure the effectiveness of the conversation (Ghose and Barua, 2013; Salomonson et al., 2013). **DP2: Timely and contextual notifications.** It should include a push-based notification module that sends context-aware task signals to reengage users after inactivity (Hillebrand and Johannsen, 2021; Gu et al., 2021). Yet, it should also dynamically adjust the frequency of such notifications to prevent exhaustion (I2; I5). **DP3: System integration.** The chatbot system should be tied to local operational systems like enterprise resource planning (ERP) or customer relationship management (CRM) to provide sustainability action prompts relevant to the work context (Cho et al., 2024; Kumar, 2024). Companies are tasked with questions of conforming with data security and privacy in case of such integration (I1; I3). **DP4: Responsive knowledge building.** The chatbot system should be able to track down the conversation history to adjust the sustainability topics and their complexity level to gradually increase their difficulty and provide back-referential suggestions and reminders (I6) (Jia, 2009; Mazumder et al., 2018). This is to facilitate the process of sustainability knowledge building. **DP5: Action facilitation and feedback.** It should include low-effort, simple-to-execute task signals and easily digestible information on sustainability to facilitate learning and motivate action-taking (Chang et al., 2021). Users can also provide feedback on how helpful the information and suggestions are, allowing for a dual-learning effect with the chatbot tool (I2). **DP6: Analytics.** To enable visual progress tracking with sustainability actions in the workplace and the state of knowledge, an analytics module with game-like design components (I2; I6) is a valuable persuasion

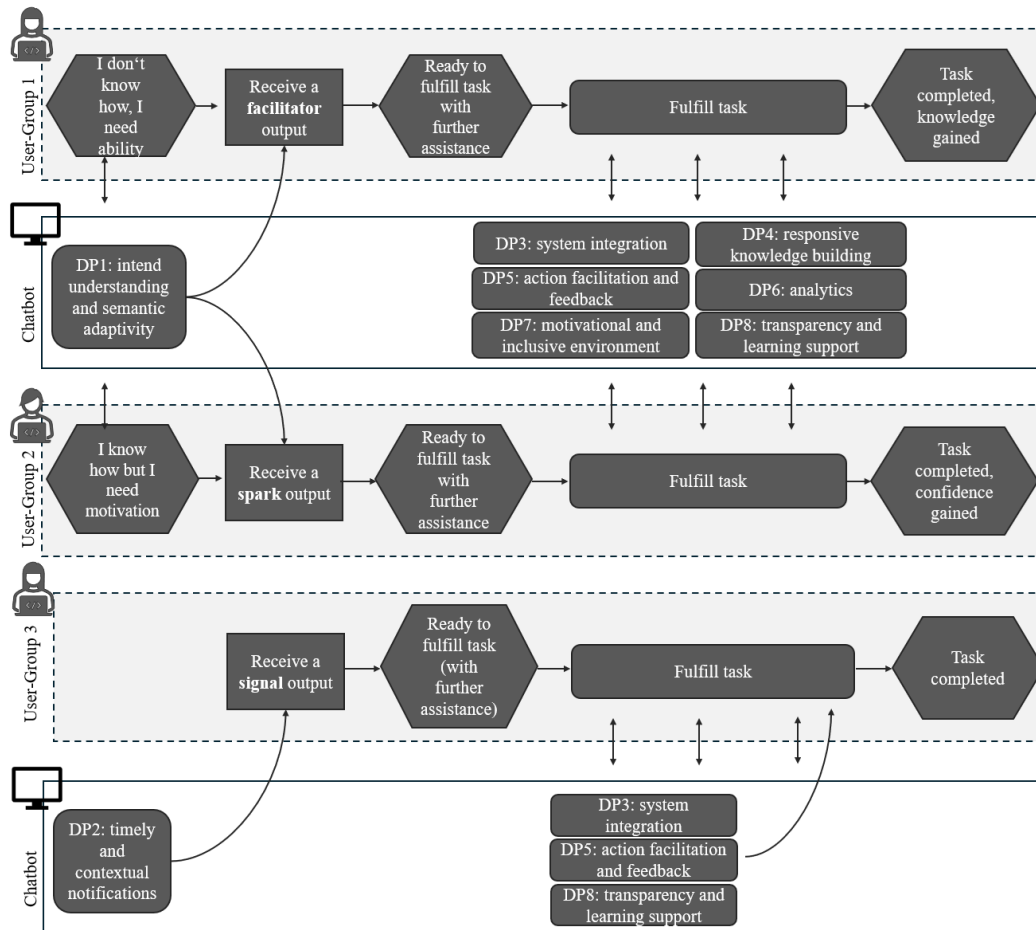


Figure 2. The framework of a CS-supporting chatbot

technique to foster user motivation for CS (Ravi, 2018; Neumann et al., 2023). **DP7: Motivational and inclusive environment.** Such gamification elements contribute to forming a digital interaction environment that promotes sustainable corporate behavior. On the other hand, audio-visual, text-to-speech, or screen-reading components are valuable in making that environment inclusive, which may intersect with some touchpoints of social sustainability (Phutane et al., 2023). **DP8: Trust and transparency.** To maintain transparency, the chatbot system must support multiple AI-based reasoning models, providing substantiation behind the generated content and thereby building trust (Huynh, 2024).

4.3. Framework for a CS-supporting chatbot

Our proposed framework was both informed by the aforementioned, evaluated design knowledge, and the theoretical mechanisms of the FBM. By applying this knowledge to the corporate context, which we already clustered into three FBM-according UGs among the employees, we structured the envisioned

chatbot support process in connection to the relevant DPs and (inter)action mode. This resulted in our framework, shown in Figure 2. UG 1 and 2 start their task processes with a starting point, which is either “I don’t know what to do, I need ability” (UG1) or “I know how, but I need motivation” (UG2).

Through the initial conversation with the chatbot (illustrated as a bidirectional arrow depicting a conversation between the user and the chatbot), the user receives an appropriate facilitator or spark output (unidirectional output from the chatbot) in the form of text, video, or other media (DP1). This is supposed to support the more sustainable behavior of the employee, who is now able to fulfill the task accordingly. The fulfillment is accompanied by a chatbot in conversation with the user (bidirectional arrows), utilizing the DPs applicable according to the trigger (DP3-8). The process ends with a successfully fulfilled task in which the employee acted in alignment with CS, demonstrating sustainable behavior. Additionally, UG1 has gained a deeper understanding of sustainability throughout the facilitating process, which can be built upon and applied in future tasks.

UG2, on the other hand, could be motivated and inspired throughout the task by the spark outputs, which, at best, build up motivation for future tasks. UG 3 has a different starting point and a shorter overall process. These users are not actively starting a task process but receive a signal (DP2) from the chatbot that initiates further action, e.g., “turn the light/your computer/etc. off”. The task then continues, possibly with a conversation with the chatbot (DP5) and a successfully fulfilled task in alignment with CS. In the following, we discuss the implications of our framework and overall study outcome, as well as our future work endeavors.

5. Discussion

The core premise of this DSR study is to craft an IS artifact that guides the design of a CS chatbot system and thereby contributes to the prescriptive knowledge base. In this paper, we explore the design of a conversational agent that supports corporate sustainability behavior, utilizing the Delphi method as a pre-study and literature review to understand the nature of current challenges. By synthesizing the findings with expert interviews, we constructed a conceptual framework for a chatbot system. The framework delineates the MRs and DPs of such a system. These principles were mapped onto Fogg’s behavioral mechanism to show how the chatbot can facilitate sustainable actions through conversational assistance. Overall, our findings point to the essence of CS action facilitation through the lens of conversational support (vom Brocke et al., 2013; Gholami et al., 2016; Menkhoff and Gan, 2023; Hillebrand and Johannsen, 2021). Despite growing interest in green IS implementations, IS research offers limited insights into the role of CAs in promoting sustainable corporate behavior. While the chatbot holds promise in encouraging sustainable action, its deployment to production involves several latent trade-offs that need to be balanced (vom Brocke et al., 2013; Luthfi and Septiyanti, 2025). For instance, organizations often rely on legacy infrastructures, and any new system must align with established workflows (Kelly et al., 1999; Cohesity Research, 2022). Interview insights further underscore this concern: one expert (I5) emphasized that unless the chatbot is seamlessly integrated into existing workflows, employees may not perceive it as part of their daily tasks, thereby limiting its impact. Another central issue is that of personalization and privacy. To enhance effectiveness, the chatbot should dynamically adjust its responses based on users’ sustainability orientation and prior knowledge (I2). However, this level of customization introduces privacy concerns

(Gumusel, 2024; Belen Saglam et al., 2021). While anonymization and compliance with General Data Protection Regulation (GDPR) are essential, excessive data obfuscation may render the chatbot less effective in delivering personalized guidance (I4). There is also a potential risk that over-reliance on chatbot interactions might reduce interpersonal knowledge exchange. This concern resonates with both prior work (Lee et al., 2021) and practitioner perspectives, with one interviewee (I5) cautioning that over-reliance on chatbot-mediated interactions may hinder informal knowledge sharing. These collateral effects, as trade-offs of privacy versus customization and personal employee versus chatbot contact, need to be investigated in more detail in our further design process. Finally, in light of customization and varying preferences for engaging with a chatbot, the degree of gamification must be determined (Santos et al., 2021; Zhang et al., 2025). Interviewees expressed divergent views on customization: while I2 highlighted its role in persuasive design success, I1 cautioned against resistance among certain user groups, illustrating another design trade-off. Overall, the study contributes to the IS literature by informing the design of a CA for sustainability and helping shape one’s perspective on the role of such a zeitgeist IS artifact in CS efforts. Practically, the framework provides brief initial guidance on crafting a chatbot design that addresses the triggering components toward the target sustainable action.

6. Conclusion

This study explores the role of CAs as IS artifacts in supporting CS actions. While chatbots have traditionally been employed in some corporate contexts, their potential to influence employee behavior towards sustainability remains peripheral. Our research addresses this gap by exploring MRs, DPs and offers a conceptual framework that serves to enhance the effectiveness of sustainability-focused chatbots in corporate settings. By adopting the DSR approach, we contribute to both sustainability and IS research by providing prescriptive knowledge on designing CAs that foster sustainable workplace practices and behavior. We also have to recognize certain limitations. On the one hand, we mainly focused on the German market and conditions, which restrains the generalizability of our study. On the other hand, the number of interviews conducted in our evaluation process was limited to six. Both factors have to be addressed and devised in our future work. Future research is likewise advised to build a prototype of the CS-supporting chatbot to validate the conceptual framework.

References

- Abu Shawar, B., & Atwell, E. (2007). Chatbots: Are they Really Useful? *Journal for Language Technology and Computational Linguistics*, 22(1), 29–49.
- Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets*, 31, 427–445.
- Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning with Applications*, 2, 100006.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Englewood Cliffs.
- Berg, M. M. (2015). NADIA: A Simplified Approach Towards the Development of Natural Dialogue Systems. In C. Biemann et al. (Eds.), *Natural Language Processing and Information Systems. NLDB 2015. Lecture Notes in Computer Science* (Vol. 9103). Springer.
- Blohm, I., & Leimeister, J. M. (2013). Gamification. *Business & Information Systems Engineering*, 5, 275–278.
- Cameron, G., Cameron, D., Megaw, G., Bon, R., Mulvenna, M., O'Neill, S., Armour, C., & McTear, M. (2017). *Towards a chatbot for digital counselling*. HCI 2017.
- Chaves, A. P., & Gerosa, M. A. (2020). How Should My Chatbot Interact? A Survey on Social Characteristics in Human–Chatbot Interaction Design. *International Journal of Human–Computer Interaction*, 37, 729–758.
- Chen, C., Chen, Y., & Jayaraman, V. (2021). *Pursuing Sustainability: OR/MS Applications in Sustainable Design, Manufacturing, Logistics, and Resource Management*. Springer International Publishing.
- Chernikova, O., Zlatitskaya, Y. A., & Nesterova, T. V. (2020). *Resource Efficiency Assessment In Mineral Resources Management*. TIES 2020.
- Cho, J., Kim, J., Bae, D., Choo, J., Gwon, Y., & Kwon, Y.-D. (2024). CAAP: Context-Aware Action Planning Prompting to Solve Computer Tasks with Front-End UI Only. *ArXiv*, abs/2406.06947.
- Chung, K., & Park, R. C. (2019). Chatbot-based healthcare service with a knowledge base for cloud computing. *Cluster Computing*, 22, 1925–1937.
- Coker, R. (2017). *Courage: Is it an Innate Virtue, or Can it be Learned?*
- Cortés-Cediel, M. E., Segura-Tinoco, A., Cantador, I., & Bolívar, M. P. R. (2023). Trends and challenges of e-government chatbots. *Government Information Quarterly*, 40(4), 101877.
- DeWall, C. N., Baumeister, R. F., & Vohs, K. D. (2008). Satiated with Belongingness? Effects of Acceptance, Rejection, and Task Framing on Self-Regulatory Performance. *Journal of Personality and Social Psychology*, 95(6), 1367–1382.
- Diamond, I. R., Grant, R. C., Feldman, B. M., Pencharz, P. B., Ling, S. C., Moore, A. M., & Wales, P. W. (2014). Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies. *Journal of Clinical Epidemiology*, 67(4), 401–409.
- Dolgui, A., Bernard, A., Lemoine, D., Cieminski, G. von, & Romero, D. (2021). *Advances in Production Management Systems: Artificial Intelligence for Sustainable and Resilient Production Systems: Part IV*. Springer International Publishing.
- Dyllick, T., & Hockerts, K. (2002). Beyond the Business Case for Corporate Sustainability. *Business Strategy and the Environment*, 11, 130–141.
- Eckhardt, F. (2020). *Sustainability: Transformation, Governance, Ethics, Law*. Springer Nature Switzerland AG.
- Ed-douibi, H., Izquierdo, J. L. C., Daniel, G., & Cabot, J. (2021). A Model-Based Chatbot Generation Approach to Converse with Open Data Sources. In M. Brambilla, R. Chbeir, F. Frasincar, & I. Manolescu (Eds.), *Web Engineering. ICWE 2021. Lecture Notes in Computer Science* (Vol. 12706). Springer.
- Elkington, J. (1999). *Cannibals with forks: The triple bottom line of the 21st century business*. Capstone Oxford.
- Elliot, S. (2011). Transdisciplinary Perspectives on Environmental Sustainability: A Resource Base and Framework for IT-Enabled Business Transformation. *Management Information Systems Quarterly*, 35(1), 197–236.
- Feine, J., Morana, S., & Maedche, A. (2020). *Designing Interactive Chatbot Development Systems*. ICIS 2020.
- Feng, X., Li, E., & Wei, C. (2024). Critical influencing factors of employees' green behavior: three-stage hybrid fuzzy DEMATEL–ISM–MICMAC approach. *Environment, Development and Sustainability*, 24, 17783–17811.
- Fogg, B. J. (2009). *A Behavior Model for Persuasive Design*, 40. ICPT 2009.
- Følstad, A., Skjuve, M., & Brandtzaeg, P. B. (2019). *Different Chatbots for Different Purposes: Towards a Typology of Chatbots to Understand Interaction Design*. International Conference on Internet Science 2019.
- Gabcanová, I. (2011). The employees - the most important asset in the organizations. *Human Resources Management & Ergonomics*, 5(1).
- George, G., & Schillebeeckx, S. J. (2022). Digital transformation, sustainability, and purpose in the multinational enterprise. *Journal of World Business*, 57, 101326.
- Ghose, S., & Barua, J. J. (2013). *Toward the implementation of a Topic specific Dialogue based Natural Language Chatbot as an Undergraduate Advisor*. ICIEV 2013.
- Gkinko, L., & Elbanna, A. (2023). The appropriation of conversational AI in the workplace: A taxonomy

- of AI chatbot users. *International Journal of Information Management*, 69, 102568.
- Gnewuch, U., Morana, S., & Maedche, A. (2017). *Towards Designing Cooperative and Social Conversational Agents for Customer Service*. ICIS 2017.
- Gu, X., Yoo, K. M., & Lee, S.-W. (2021). Response Generation with Context-Aware Prompt Learning. *ArXiv, abs/2111.02643*.
- Gurcan, F., Boztas, G. D., Dalveren, G. G., & Derawi, M. (2023). Digital Transformation Strategies, Practices, and Trends: A Large-Scale Restrospective Study Based on Machine Learning. *Sustainability*, 15(9), 7496.
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *Management Information Systems Quarterly*, 28(1), 75–105.
- Hillebrand, K., & Johannsen, F. (2021). *KlimaKarl – A Chatbot to Promote Employees' Climate-Friendly Behavior in an Office Setting*. DESRIST 2021.
- Huysman, S., Sala, S., Mancini, L., Ardente, F., Alvarenga, R. A., Meester, S. de, Mathieux, F., & Dewulf, J. (2015). Toward a systematized framework for resource efficiency indicators. *Resources, Conservation and Recycling*, 95, 68–76.
- Jain, M., Kumar, P., Kota, R., & Patel, S. N. (2018). *Evaluating and Informing the Design of Chatbots*. DIS 2018.
- Janssen, A., Passlick, J., Cardona, D. R., & Breitner, M. H. (2020). Virtual Assistance in Any Context - A Taxonomy of Design Elements for Domain-Specific Chatbots. *Business & Information Systems Engineering*, 62(3), 211–225.
- Jia, J. (2009). CSIEC: A computer assisted English learning chatbot based on textual knowledge and reasoning. *Knowledge-Based Systems*, 22(4), 249–255.
- Kimura, H., & Nakajima, T. (2011). Designing Persuasive Applications to Motivate Sustainable Behavior in Collectivist Cultures. *Psychology Journal*, 9(1), 7–28.
- Knijnenburg, B. P., & Willemsen, M. C. (2016). Inferring Capabilities of Intelligent Agents from Their External Traits. *ACM Transactions on Interactive Intelligent Systems*, 6(4), 1–25.
- Kumar, V. (2024). *Context-Aware RAG: Enhancing AI with Contextual Awareness* (No. 05.03), 2025. <https://adasci.org/context-aware-rag-enhancing-ai-with-contextual-awareness/>.
- Leknes, S., & Tracey, I. (2008). A common neurobiology for pain and pleasure. *Nature Reviews Neuroscience*, 9, 314–320.
- Liu, B [Bingjie], & Sundar, S. (2018). Should Machines Express Sympathy and Empathy? Experiments with a Health Advice Chatbot. *Cyberpsychology, Behavior, and Social Networking*, 21(10), 625–636.
- Lülf, R., & Hahn, R. (2014). Sustainable Behavior in the Business Sphere: A Comprehensive Overview of the Explanatory Power of Psychological Models. *Organization & Environment*, 27(1), 43–64.
- Maedche, A., Legner, C., Benlian, A., Berger, B., Gimpel, H., Hess, T., Hinz, O., Morana, S., & Söllner, M. (2019). AI-Based Digital Assistants: Opportunities, Threats, and Research Perspectives. *Business & Information Systems Engineering*, 61(4), 535–544.
- Mazumder, S., Ma, N., & Liu, B [Bing] (2018). Towards a Continuous Knowledge Learning Engine for Chatbots. *ArXiv, 1802.06024*.
- Morschheuser, P. C., Alt, R., Sachse, S., & Morschheuser, B. (2022). *Gamifying Sustainable Behavior at Work: Results from an Experiment with a Corporate Gamification App*. ICIS 2022.
- Mustaquim, M., & Nyström, T. (2014). *Designing Persuasive Systems for Sustainability - A Cognitive Dissonance Model*. ECIS 2014.
- Okoli, C. (2015). A Guide to Conducting a Standalone Systematic Literature Review. *Communications of the Association for Information Systems*, 37, 880–905.
- Okoli, C., & Pawlowski, S. D. (2004). The Delphi Method as a Research Tool: An Example, Design Considerations and Applications. *Information & Management*, 42(1), 15–29.
- Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2008). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, 24(3), 45–77.
- Pérez, J. Q., Daradoumis, T., & Puig, J. M. M. (2020). Rediscovering the use of chatbots in education: A systematic literature review. *Computer Applications in Engineering Education*, 28(6), 1549–1565.
- Reshmi, S., & Balakrishnan, K. (2018). Empowering Chatbots with Business Intelligence by Big Data Integration. *International Journal of Advanced Research in Computer Science*, 9(1), 627–631.
- Rowe, G., & Wright, G. (2001). Expert Opinions in Forecasting: The Role of the Delphi Technique. In J. S. Armstrong (Ed.), *Principles of Forecasting* (pp. 125–144). Kluwer Academic.
- Rusch, M., Schöggel, J.-P., & Baumgartner, R. J. (2021). Application of digital technologies for sustainable product management in a circular economy: A review. *Business Strategy and the Environment*, 1–16.
- Sabbir, M. M., & Taufique, K. M. R. (2021). Sustainable employee green behavior in the workplace: Integrating cognitive and non-cognitive factors in corporate environmental policy. *Business Strategy and the Environment*, 31(1), 110–128.
- Salomonson, N., Allwood, J., Lind, M., & Alm, H. (2013). Comparing Human-to-Human and Human-to-AEA Communication in Service Encounters. *Journal of Business Communication*, 50(1), 87–116.

- Schöbel, S. M., Janson, A., & Söllner, M. (2020). Capturing the complexity of gamification elements: a holistic approach for analysing existing and deriving novel gamification designs. *European Journal of Information Systems*, 29(6), 641–668.
- Schrade-Grytsenko, L., Kappler, K.E. & Smolnik, S. (2022). Assisted Sustainability - A Practical IS Approach to Promote Corporate Sustainability. AMCIS 2022.
- Schrade-Grytsenko, L., Kappler, K.E. & Smolnik, S. (2025). Assisted Sustainability: How Digital Technologies Promote Corporate Sustainability. *Sustainability*, 17(12), 5561.
- Shah, H., Warwick, K., Vallverdú, J., & Wu, D. (2016). Can machines talk? Comparison of Eliza with modern dialogue systems. *Computers in Human Behavior*, 58, 278–295.
- Siivonen, M., Pirkkalainen, H., Khan, B. A., & Xi, N. (2024). *Effects of intrinsic and extrinsic motivation on gamified competence development support*. SCIS 2024.
- Skinner, B.F. (1953). *Science and Human Behavior*. The Free Press, New York.
- Skinner, R., Nelson, R. R., Chin, W. W., & Land, L. (2015). The Delphi Method Research Strategy in Studies of Information Systems. *Communications of the Association for Information Systems*, 37(2), 31–63.
- Sonnenberg, C., & vom Brocke, J. (2012). Evaluations in the Science of the Artificial - Reconsidering the Build-Evaluate Pattern in Design Science Research. In K. Peffers, M. Rothenberger, & B. Kuechler (Eds.), *Design Science Research in Information Systems. Advances in Theory and Practice. DESRIST 2012. Lecture Notes in Computer Science* (Vol. 7286, pp. 381–397). Springer.
- Stein, C., Teubner, T., & Morana, S. (2024). Designing a conversational agent for supporting data exploration in citizen science. *Electronic Markets*, 34, 23.
- Steininger, R. (2025). *Apply Tiny Habits to Business Growth with Fogg Behavior Model*. <https://upwardacceleration.com/apply-tiny-habits-to-business-growth-with-fogg-behavior-model/>
- Tan, M., & Sarif, S. M. B. (2024). A Review of Fogg's Behavior Model (FBM) and Hook Models for Gamified Learner Experience in Higher Education. *Linguistics and Philosophical Investigations*, 23(1), 21–32.
- Tavanpour, N., Mathis, P., & Bittner, E. A. (2019). *Supporting the idea generation process in citizen participation - toward an interactive system with a conversational agent as facilitator*. ECIS 2019.
- Thiebes, S., Lins, S., & Basten, D. (2014). *Gamifying Information Systems - A Synthesis of Gamification Mechanics and Dynamics*. ECIS 2014.
- Todd, P., & Benbasat, I. (1992). The Use of Information in Decision Making: An Experimental Investigation of the Impact of Computer-Based Decision Aids. *MIS Quarterly*, 16(3), 373–393.
- Tsai, M.-H., Chang, Y.-L., Kao, C., & Kang, S.-C. (2015). The effectiveness of a flood protection computer game for disaster education. *Visualization in Engineering*, 3, 9.
- Tussyadiah, I., & Miller, G. (2019). Nudged by a robot: Responses to agency and feedback. *Annals of Tourism Research*, 78.
- Umarusman, N., & Haciveliogullari, T. (2021). Fuzzy inference system in sustainable supplier. In S. K. Mangla & M. Ram (Eds.), *Supply Chain Sustainability* (pp. 1–38). Walter de Gruyter GmbH.
- United Nations. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development: A/RES/70/1*. Unpublished Work.
- United Nations / Framework Convention on Climate Change, United Nations. (2015). *Adoption of the Paris Agreement, 21st Conference of the Parties*. United Nations, Department of Economic, & Affairs, S. (2020). *SDG GoodPractices: A compilation of success stories and lessons learned in SDG implementation*. Unpublished Work.
- van der Goot, M. J., Hafkamp, L., & Dankfort, Z. (2021). Customer Service Chatbots: A Qualitative Interview Study into the Communication Journey of Customers. In A. Følstad et al. (Eds.), *Chatbot Research and Design* (pp. 190–204). Springer.
- Volpato, T., Allian, A., & Nakagawa, E. Y. (2019). *Has social sustainability been addressed in software architectures? ECSA 2019*.
- Wache, H., Möller, F., Schoormann, T., Strobel, G., & Petrik, D. (2022). *Exploring the Abstraction Levels of Design Principles: The Case of Chatbots*. WI 2022.
- Wang, X., Lin, X., & Shao, B. (2022). How does artificial intelligence create business agility? Evidence from chatbots. *International Journal of Information Management*, 66, 102535.
- White, K., Hardisty, D. J., & Habib, R. (2019). The Elusive Green Consumer. *Harvard Business Review*, 3–11.
- World Commission on Environment Development Brundtland, Gro Harlem. (1991). *Our Common Future: Report of the World Commission on the Environment and Development [Brundtland Report] // Our common future* (13. impr). Oxford paperbacks. Oxford University Press Univ. Press.
- Zhao, T., Lu, A., Lee, K., & Eskenazi, M. (2017). *Generative Encoder-Decoder Models for Task-Oriented Spoken Dialog Systems with Chatting Capability*. Annual SIGdial Meeting on Discourse and Dialogue.
- Zhenjing, G., Chupradit, S., Ku, K. Y., Nassani, A. A., & Haffar, M. (2022). Impact of Employees' Workplace Environment on Employees' Performance: A Multi-Mediation Model. *Frontiers of Public Health*, 10, 890400.