

Howdy, Robo-Partner: Exploring
Artificial Companionship and Its
Stress-Alleviating Potential for
Service Employees

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Abstract

Purpose: The emergence of new generations of artificial intelligence (AI), such as ChatGPT or Copilot has brought about a wave of innovation in the service workplace. These robotic agents can serve as companions, helping employees cope with work-related stress. This research introduces the concept of “artificial companionship,” which explains how robotic agents can function as partners in assisting service employees to fulfill their job responsibilities and maintain their mental well-being.

Design/methodology/approach: This research uses a mixed methods approach grounded in social support theory from psychology and management to develop a conceptual framework for the stress-alleviating implications of artificial companionship. A qualitative employee survey is conducted to justify the relevance of the propositions.

Findings: This research delineates the concept of artificial companionship. It highlights four distinct roles that AI can play in companionship – instrumental, informative, caring, and intimate. Building on this foundation, the research presents a series of propositions that elucidate the potential of artificial companionship in mitigating stress among employees.

Practical implications: Firms should consider aligning the types of artificial companionship with the demands inherent in employees’ job responsibilities to better reinforce their resilience and sustainment in overcoming work-related challenges.

Originality/value: This research introduces a new perspective on artificial companionship through the lens of social support theory. It extends the current understanding of human-robot collaboration in service workspaces and derives a set of propositions to guide future investigations.

Keywords: Service employee, Stress, Artificial companionship, Artificial intelligence, Mental resilience, Mental sustainment, Well-being.

Paper type: Conceptual paper.

Introduction

Frontline employees are expected to be responsive around the clock, which can entail stress and anxiety and potentially affect their productivity and well-being (Harris and Fleming, 2017). They face various stressors, including direct customer interactions, managing client needs and demands, resolving conflicts, and engaging with managers (Hon and Chan, 2013; Voorhees *et al.*, 2020). While these tasks are necessary for business operations and career advancement, they can also negatively impact mental health due to stress and insufficient support (Jolly *et al.*, 2021). In this context, new generations of robotic technologies can act as ‘artificial companions’ (ACs) to assist employees in managing their workload (Bosch *et al.*, 2022). Prior research identifies two approaches to studying the impacts of technology in the service frontline – augmentation and substitution (De Keyser *et al.*, 2019). The emergence of newer robotic agents marks a significant shift where ACs are expected to team up with employees to accomplish a shared objective (Tuzovic, 2024). These robotic agents exhibit a high degree of autonomy and are intricately involved in task execution (Le *et al.*, 2024). For instance, Microsoft Copilot offers advanced support in tasks such as spreadsheet analysis (McGregor, 2023).

The application of robotic technologies in the service workplace is of growing interest among scholars and practitioners (Sajtos *et al.*, 2024). This research makes three contributions to the discourse on human-robot collaboration in a shared workplace. First, it draws on social support theory (Lahey and Cohen, 2000) to outline a typology of artificial companionship. This research proposes mechanisms to delineate the impacts of artificial companionship. This focus offers novel insights into the realm of well-being management with technology (Noble *et al.*, 2022).

Second, our research enriches the notion of transformative robotic service (Henkel *et al.*, 2020b) by discussing how different types of artificial companionship that are currently

available (i.e., caring, informative, instrumental) can enhance employee well-being. We substantiate these propositions with a qualitative survey, which helps further the understanding of the potential of transformative robotic technology in achieving the United Nations' Sustainable Development Goals for improved well-being (Bieller, 2024).

Third, this research suggests potential avenues across societal, organizational, and individual levels of impact for future investigations to understand better the implications of artificial companionship beyond its role in enhancing employee well-being, contributing to wider calls for attention to societal well-being in the age of AI (Kunz and Wirtz, 2024).

We begin by discussing the concept of companionship and the extant literature on artificial companions. Next, we conceptualize artificial companionship based on social support theory. Then, we explore the stress-buffering effects of artificial companionship. Finally, we conclude with a general discussion and propose directions for future research.

Theoretical Background

The Companionship Concept

Companionship and social assistance are distinctive yet interrelated concepts. Social assistance refers to the supportive resources individuals obtain from interacting with others to overcome challenging tasks and events. Companionship is defined as “the combination of attachment, commitment, and intimacy” (Lee *et al.*, 2017, p. 924) between interactive parties, encompassing both tangible assistance and the development of long-term connections (Cyranski *et al.*, 2013). Table 1 provides a contrast between companionship and general support. Companionship is distinctive for its higher level of intimacy and long-term support focus (Rook, 1987), whereas general support emphasizes situational problem-solving with a short-term support focus. A similar notion of general support in marketing literature is ‘commercial friendships’ (Rosenbaum, 2009), where support provision is fundamentally

transactional, but it is overlaid with interactions that are personal and friendly, creating a resemblance of friendship.

[Table 1 here]

Companions are broadly defined as agents (both human and non-human) that interact (in)directly with a focal actor throughout their experience journey (Hamilton *et al.*, 2021). Recent research also suggests that AI-based agents and similar robotic technologies can provide a level of companionship beyond generic support (Ramadan *et al.*, 2021) and even establish an intimate connection to a certain extent (Belk, 2022). Similarly, artificial agents are also being utilized in customer care beyond conventional support (Huang and Rust, 2022). The companionship notion in this context emphasizes both support delivery and intimacy. Hence, while the fundamental function of companionship and general support is similar (i.e., providing assistance), companionship represents a more comprehensive approach. Companionship is not exclusive to human-human interactions but also emerges in human-artificial agent interactions (Hamilton *et al.*, 2021).

One unique aspect of companionship is the mutuality and value co-creation with robotic agents (Bock *et al.*, 2020). While humans benefit most from these interactions (e.g., enhanced performance capabilities – Grewal *et al.*, 2020), robotic agents also benefit from this interaction by receiving training and helping maintain systems from humans, which improves the overall system's performance. Continuous engagement with humans can also improve robots' accuracy and efficiency (Wilson and Daugherty, 2018). Hence, companionship in human-robotic agent interactions can be reciprocal. This research focuses on exploring the role of robotic agents as companionship providers.

Extant Literature on ACs

The proliferation of AI-enabled technology has reshaped traditional interpersonal relations (Hamilton *et al.*, 2021). ACs can now perform complex tasks (Chaturvedi *et al.*,

2024). These advancements have made ACs such as Replika increasingly prominent in forming social bonds with users and delivering support (Skjuve *et al.*, 2021). Research on ACs is scattered across various disciplines. Table 2 below provides an overview of previous attempts to understand the impacts of these agents.

[Table 2 here]

ACs can fulfill various social roles (Hamilton *et al.*, 2021), ranging from advisor (Kim *et al.*, 2022; Luo *et al.*, 2021) and assistant (Araujo *et al.*, 2022; Čaić *et al.*, 2018; Lu *et al.*, 2021) to romantic partner (Belk, 2022), addressing various users' functional needs (Lee *et al.*, 2017) and socio-emotional needs (Chaturvedi *et al.*, 2024). For instance, ACs can assist single-person households in maintaining emotional stability and ensuring psychological well-being amidst stressful social isolation and loneliness (Odekerken-Schröder *et al.*, 2020; Lee *et al.*, 2017). They can also enhance the effectiveness of mental health interventions by offering peer-like support, involving sharing experiences and information, or mimicking empathetic behaviors to develop therapeutic alliances with patients and contribute to their overall psychological well-being (Jeong *et al.*, 2023; Lu *et al.*, 2021). Recent research has recognized the emergence of ACs in assisting customers throughout their social journey and extending into their personal lives (Flavián *et al.*, 2024; Hamilton *et al.*, 2021).

There are emerging investigations highlighting the use of ACs to support service employees (e.g., Lin *et al.*, 2024; Luo *et al.*, 2021; Perner, 2020). For example, support from ACs can foster an entertaining and cooperative workplace, where employees exhibit reduced mental fatigue, along with more positive emotions, resulting in higher levels of service hospitableness (Qiu *et al.*, 2022; Tuomi *et al.*, 2021; Xu *et al.*, 2023). Teachers and tutors can use ACs to access predictive information on students' performance, enabling them to offer personalized training services that enhance student experience (Kim *et al.*, 2022). Employees can also rely on ACs to receive real-time feedback on customers' emotions, improving their

effectiveness in regulating customer emotions (Henkel *et al.*, 2020a). Such evidence suggests that ACs hold the potential to offer multiple benefits to frontline employees. They can enhance the effectiveness and efficiency of task execution (Pemer, 2020; Kim *et al.*, 2022) and bolster frontline employees' ability to manage work-related stress and emotions (Qiu *et al.*, 2022). Thus, ACs can elevate employees' performance and satisfaction, and improve their well-being, which contributes to better service operations and outcomes.

Despite the emergence of human-robot collaboration to co-manage daily tasks within and beyond service workplaces (Huang and Rust, 2022; Noble *et al.*, 2022), there remains a lack of systematic integration concerning the supportive roles of ACs. Furthermore, the ways in which ACs affect frontline employees' mental well-being and the contingencies that influence these relationships remain unexplored (cf. Table 2). The current research draws on social support theory to examine how different types of artificial companionship can be conceptualized and employed to provide support.

A Conceptualization of Artificial Companionship

Social Support Theory

Social support denotes the situation where someone provides assistance to another person with the intention of improving their well-being (Shumaker and Brownell, 1984; Thoits, 1986). This assistance can come in the form of motivation, compassion, or actual help (Lakey and Cohen, 2000). Social support can help reduce role conflict and ambiguity (Carlson and Perrewé, 1999), lessen job insecurity (Schreurs *et al.*, 2012), and prevent burnout, ultimately reducing the desire to leave a job (Lee *et al.*, 2021).

Social support can be classified into two dimensions – the coping strategy utilized by *the support receiver* and the type of support that comes from the provider (Billings and Moos, 1981; Cohen and Wills, 1985). The distinction between these dimensions lies in the dynamic of the support provider-recipient relationship (Hupcey, 1998). *Types of support* highlight the

ways in which *providers* assist *support recipients*. For example, cancer patients receive support from caregivers and doctors (Kelly *et al.*, 2019). *Coping strategies* emphasize the deliberate evaluation process undertaken by support recipients (Hupcey, 1998), which is an internal appraisal process. However, the mere presence of an effective coping strategy might not guarantee effective stress management. The availability and appropriateness of support resources are also critical in enabling individuals to utilize their coping strategies effectively. Thus, the alignment between the recipient's coping strategies and the support provided is key to enhancing the efficacy of stress management efforts.

Coping strategy specifies the scheme that an individual utilizes to resolve challenges through either behavioral or cognitive coping (Billings and Moos, 1981). Behavioral coping involves engaging in practical actions to manage job demands (Colquitt *et al.*, 2021). For example, an employee might extend their working hours to fulfil the demands of a business operation. In contrast, cognitive coping focuses on mental states such as strategizing or self-motivating (Colquitt *et al.*, 2021).

Types of support specify the way in which support is delivered (Billings and Moos, 1981). It emphasizes two approaches through which support is delivered: task-oriented and emotion-oriented support (Latack and Havlovic, 1992). Task-oriented support involves the support provider assisting recipients with problem-solving or managing work-related duties. In contrast, emotion-oriented support aims to influence recipients' moods to help maintain their positive emotional state (Billings and Moos, 1981). It involves providing comfort or validation to help someone cope with emotional distress, such as listening to a colleague venting their anger or frustration. Both types of support ensure that employees have the external resources and assistance needed to function in a stressful workplace.

Previous research has highlighted that human-robot service interactions involve role enacting, enabled by robots' ability to provide human-like verbal and non-verbal cues (Blaurock *et al.*, 2022). This research complements prior work by delineating the artificial companionship concept, highlighting the multifaceted roles robots can play in the workplace. As robotic technology increasingly shapes organizational frontline operations, service employees, among other stakeholders, are directly influenced by such adoption. The artificial companionship concept represents an advancement in applying social support theory to robotic technologies.

Recent research has recognized the emergence of ACs in assisting customers throughout their experience journey (Hamilton *et al.*, 2021). The current research focuses on the employee perspective to expand the coverage of this phenomenon. The starting point of our conceptualization is to explicate what can be considered an AC. Previous research referred to robotic technologies as “system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization’s customers” (Wirtz *et al.*, 2018 p. 909). Drawing on this notion, ACs can be both embodied (robots with a physical representation) and disembodied (robots with a digital representation). ACs can perform a wide range of complex tasks (Čaić *et al.*, 2018). For example, physical robots are deployed in elder care to assist both customers and nurses with tasks such as lifting bedridden patients (Čaić *et al.*, 2019), or GPT-4 can function as a software engineer due to its ability to pass structured coding interviews (Bubeck *et al.*, 2023).

This research proposes that ACs can possess characteristics of support providers due to their widespread assistive capabilities and a high degree of agency. Therefore, this research defines artificial companionship as *the utilization of robotic systems (either digital or physical) to provide tangible and intangible long-term support to frontline employees in*

fulfilling their responsibilities. Artificial companionship differs from general support in two main ways. First, it involves long-term and reciprocal engagement with the AC, as these non-human entities can influence decision-making across various stages (Hamilton *et al.*, 2021), whereas general support typically involves a one-off interaction. Second, general support focuses more on utilitarian exchanges in social interactions to help the recipient cope with immediate stressful situations (Rook, 1987). In contrast, artificial companionship can facilitate interactions beyond utilitarian values, with these non-human entities able to facilitate more intimate interactions (Kim *et al.*, 2022).

Service provision is particularly stressful for frontline employees, who directly interact with customers or clients (Voorhees *et al.*, 2020). The source of stress can stem from customer involvement in the service process (Blut *et al.*, 2020) or work-related conflicts (Hon and Chan, 2013). In this context, artificial companionship can provide valuable assistance in managing stressors. Recent research shows that emotion classification algorithms can achieve up to 80% accuracy in predicting employee stress levels (Bromuri *et al.*, 2021). Furthermore, ACs have also been deployed in the healthcare sector as an alternative source of peer support (Yorita *et al.*, 2018). Additionally, working with robots can reduce employee mental fatigue by assigning the stock-level monitoring task to robots, thereby offloading this responsibility from employees (Willems *et al.*, 2023). These findings underline the usefulness of artificial companionship in assisting employees. This research develops a 2x2 typology of artificial companionship, highlighting different supportive functions of ACs (see Figure 1). The typology is characterized by the interplay between what ACs can deliver and the strategies service employees can use to cope with stress.

[Figure 1 here]

Quadrant 1 spotlights instrumental companionship, characterized by ACs delivering task-oriented support to assist human employees with their behavioral coping strategy. The

human-centric perspective on companionship implies a certain degree of bonding (Rook, 1987). However, our conceptualization of artificial companionship extends beyond this notion to encompass any form of consistent and reliable presence that supports an individual in navigating various tasks throughout their journey. This broader interpretation of companionship is evident in emerging research, which suggests that individuals can derive a sense of companionship from non-human entities providing instrumental support, even without emotion or social interaction (Tuomi *et al.*, 2021). Examples include generative AI Midjourney or Robotic Care Bed, which assists nurses with heavy lifting.

Quadrant II spotlights informative companionship, depicting the role of knowledge provider, which is characterized by ACs delivering task-oriented support to assist employees with cognitive coping. Informative companions do not actively participate in decision-making. For example, GPT-4 can help employees search for theoretical concept definitions or provide advice on how to use specific terminologies, but employees make the final decisions as to how they want to use the provided information. Similarly, physical robots like Pepper can provide tour information (Burton, 2018).

Quadrant III refers to caring companionship, characterized by ACs that deliver emotion-oriented support to bolster employees' cognitive coping. This form of companionship provides employees with a sense of caring during challenging situations in service provision. Recent advancements in technology have allowed robotic agents to play a leading role in customer care services (Huang and Rust, 2024). Hence, such technologies can be adapted to the 'employee care' context to address the emotional demands of their job. For instance, employees can share the difficulties they are facing in their jobs with Replika. Similarly, Wysa – a mental care companion – can provide emotional support for users (Malik *et al.*, 2022).

Quadrant IV describes intimate companionship, characterized by ACs providing emotion-oriented support to assist employees with behavioral coping during stressful situations. Unlike the previous quadrants, current generations of ACs are unable to provide this type of companionship effectively. True intimate companionship can be found between family members or among close friends who share mutual interests. This entails genuine emotional connections, shared experiences, and reciprocal understanding (Reis and Shaver, 1988). Nonetheless, given the proliferation of technological advancements in AI capability, this quadrant will be a prominent research area once the technology can afford a human-like level of intimacy (e.g., Belk, 2022). A hypothetical example of intimate companionship is the case of Joi – the ‘artificial girlfriend’ in the movie *Blade Runner 2049*. Joi is a holographic AC created by a fictional corporation in the movie. Joi can simulate human interactions and create a convincing illusion of human presence. For example, Joi can prepare a ‘virtual dinner,’ ask her partner to read a book to her, or dance with her. This fictional character simulates a near-true intimate interaction that can be found in human relationships.

The proposed typology extends social support theory (Shumaker and Brownell, 1984) by broadening its application beyond the traditional human-centric companionship. It highlights the potential of advanced AI-based agents to perform complex supportive functions typically provided by human companions. Artificial companionship will have major implications for employees, especially as human-robot collaboration is rapidly entering the service domain (Le *et al.*, 2023). Thus, we integrate existing literature on ACs and develop a research framework to explore their role in acting as a stress-buffering layer that mitigates pressures in service provision by improving two mental processes – resilience and sustainment.

Social support theory suggests that external support can facilitate stress regulation (Sippel *et al.*, 2015), thereby enhancing an individual’s aptitude for managing challenging

situations. Our research refers to ‘mental resilience’ as an individual’s belief in their ability to “recover, re-bounce, bounce-back, adjust or even thrive following misfortune, change or adversity” (Rees *et al.*, 2015, p. 2). Mental resilience reflects the mind’s capacity to withstand difficult situations. We delve into the two subdimensions of resilience – (1) perseverance (the commitment to achieve one’s objective in light of hardship) and (2) disruption recovery (the capacity to rebound from adverse events) (Hartwig *et al.*, 2020). Robots have the potential to alleviate loneliness and enhance older adults’ resilience (Hoorn, 2018), emphasizing the significance of ACs in this context.

Another mechanism is mental sustainment – the maintenance of one’s mental state, which is reflected through self-identity and self-esteem (Shumaker and Brownell, 1984). Receiving support can bolster one’s self-identity by affirming their sense of belonging (Haslam *et al.*, 2005). Social support provides reassurance, enhancing an individual’s self-worth (Shumaker and Brownell, 1984) and mitigating the risk of developing depression (Orth *et al.*, 2009). ACs extend beyond automation and can reinforce an individual’s sense of self-identity and self-worth by influencing their work experience rather than posing a threat (Malodia *et al.*, 2021).

A Research Framework on the Stress-Alleviating Impacts of Artificial Companionship

Research Framework Overview

This research proposes that ACs can play a major role in assisting employees with managing their job tasks. In this context, our proposed framework aims to explore the impacts of ACs on stress alleviation. Consequently, we focus on ‘perceived stress’ – “a psychological response to demands that possess certain stakes for the people and that tax or exceed the person’s capacity or resources” (Colquitt *et al.*, 2021 p. 125) – as the main outcome. Stress has been linked to other negative consequences such as low job performance

or satisfaction (Harris and Fleming, 2017). Therefore, understanding effective stress management is necessary to enhance employee well-being. Exploring the impact of these agents in assisting employees with stress management could help managers decide how best to utilize such agents to support employees. The research framework is presented in Figure 2. We also conducted an employee survey to understand how artificial companionship is being used. We utilize this survey to provide further support for our propositions. The employee survey results also provide evidence of the use cases of different types of available artificial companionship in service work-related contexts. Detailed information regarding the methodology, justification, survey questionnaire, and findings can be found in the Web Appendix. The insights derived from the thematic analysis of the qualitative survey data are summarized in Figure 3.

[Figure 2 and 3 here]

The Mediating Role of Mental Resilience and Sustainment

Social support is intended to improve the well-being of the recipient (Shumaker and Brownell, 1984). Prior research has documented how mental resilience can reduce accumulated negativity in the workplace through peer support (Anasori *et al.*, 2023). Considering that employees are increasingly expected to utilize AI-based agents to assist them in their work, it is plausible that artificial companionship enhances their ability to manage work-related stress by improving mental resilience.

Informative and instrumental companions primarily offer task-oriented support and provide instructions to help employees in their decision-making processes. For example, the GitHub Copilot agent can increase productivity, decrease coding-related frustration, and preserve developers' mental energy (GitHub, 2022). These agents reduce stress by enhancing resilience through managing certain aspects of employees' actual workload. Such assistance

enhances their confidence and perseverance in achieving their goals and reduces uncertainty (Shamim *et al.*, 2023).

In the employee survey, participants utilize instrumental and informative companions for transactional tasks and problem-solving. This reduces stress by enhancing mental resilience, which manifests through improved perseverance and faster recovery from disruption at work. In this vein, efficiency is gained through working with ACs to improve perseverance in completing transactional and prolonged tasks by streamlining processes and reducing tedious aspects of work. Specifically, participants have noted that using the AC for coding and writing tasks allows them to persist with their work without delays, enhancing productivity and freeing up time for more creative endeavors.

“ChatGPT can help me continue my work until finished. When writing an activity plan for my company, it is hard to cover every aspect. However, with the help of ChatGPT, I can quickly get some brainstorming ideas and a detailed activity outline, which saves me a lot of time.” (Participant 10, Female, Marketing Coordinator, Hospitality and Tourism)

“Writing long reports requires a lot of perseverance, and I am able to use AI to help me by doing the more boring parts of my role, so I can concentrate on more creative sides that I enjoy.” (Participant 18, Female, Professional Service Provider, Information Technology)

ACs also play a crucial role in ensuring the continuity of service workflows. They enable easy restarts after interruptions, speed up the learning process for catching up on projects, and offer quick access to prior work, facilitating a smooth transition back into tasks. Additionally, ACs assist in managing disruptions by helping with writing, facilitating quick edits, and updating project timelines in real time. The benefits derived from engaging with ACs help employees recover efficiently from disruptions and maintain a continuous workflow, particularly in situations where work is halted or extended over time.

“It definitely does help, the learning curve and catching up with AI is much faster than without it, so if I am lagging behind with something or have not had a chance to work on a project for a while, it is easier to catch up with the help of technology.” (Participant 11, Male, Academic Staff, Education)

“Well, it has helped recover from a problem so much faster. For example, if a server went down it could take a day or two to find the glitch. Now our tech teams have us recovered within hours.”
(Participant 54, Male, Operation Manager, Information Technology)

Based on the literature analysis and employee survey data, instrumental and informative ACs support mental resilience by improving perseverance and recovery from work disruption. These ACs increase efficiency and productivity, facilitate workflow management, and enable service employees to focus on more fulfilling tasks, which, in turn, help mitigate work-related stress. Caring companionship (e.g., Replika) primarily involves delivering emotion-oriented support (e.g., Belk, 2022). While crucial for fostering positive well-being, this type of support may not directly address employees’ specific work challenges. Hence, it might not be as effective as informative and instrumental companions due to its limited capacity to provide direct service task-related assistance.

Proposition 1. Artificial companionship will reduce perceived stress by increasing employees’ mental resilience. This effect is stronger for informative and instrumental companions compared to caring companions.

This research suggests that employees’ mental sustainment will also mediate the impacts of artificial companionship on perceived stress. Receiving external assistance from relatives and peers can help alleviate the negative effects of stress by positively influencing one’s mindset and emotions (Thoits, 1986). This emotional reinforcement helps maintain a positive self-perception. Human companions have naturally fulfilled this role; however, advancements in generative AI are now challenging this aspect of human companionship. Recent research suggests that robotic agents can also effectively provide emotional support to a certain extent (Huang and Rust, 2024). Our proposition extends social support theory to encompass the impact of ACs on emotional well-being.

Previous research indicates that interactions with ACs can enhance users’ well-being (Liu-Thompkins *et al.*, 2022) and fulfill self-expression needs (Malodia *et al.*, 2021) through emotional connections. Unlike informative and instrumental artificial companions, which

specialize in task-related support, our research contends that caring companions exert a greater influence on employee self-esteem and -identity. These agents reinforce personal values and beliefs by providing reassurance. Employees can freely express themselves when engaging with caring companions without the fear of being judged (Portela and Granell-Canut, 2017). Over time, employees may develop an attachment to these agents, integrating caring companions into their routines (e.g., talking about their daily work with Replika), which fosters an association of their new identity with the companion. Recent research suggests that interacting with caring companions might boost one's self-esteem (Ameen *et al.*, 2022) as it focuses on supporting one's feelings. This empowers employees and improves their sense of control and worthiness (Gelbrich *et al.*, 2021), contributing to feelings of empowerment and confidence.

We observed similar responses in our employee survey, indicating that caring companions can boost the sense of accomplishment when employees fulfill their job responsibilities with their assistance. In contrast, instrumental and informative companions lack the ability to mimic human emotions and, therefore, may not contribute as effectively to the development of self-esteem and -identity. Additionally, caring companionship mitigates stress by reinforcing employees' belief in their ability to overcome challenges, contributing to the maintenance of their self-image.

"I think that AI could be used to boost self-esteem by reminding the user of their strengths and their self-identity. This could be useful to take the employee out of a work situation and remind them that their work life is not what defines them." (Participant 46, Male, Process Operator, Manufacturing)

"If I was struggling at work -particularly when in the office - and wanted to vent safely in a private space, [...] AI 'listening' would be a really good place for that. When my self-esteem is feeling low, it could turn the day around and keep me on track for work goals that day or week." (Participant 55, Female, Project Manager, Education)

Overall, the literature and data suggest that ACs, particularly caring companions, can enhance self-esteem and -identity among service employees by boosting a sense of

accomplishment and fostering a feeling of pride and self-worth. By offering reminders of personal strengths, providing motivational support, and creating safe spaces for emotional expression, these companions enhance employees' mental sustainment, supporting their emotional state in stressful situations. Therefore, caring companions are likely to contribute to a more supportive and empowering work experience, ultimately benefiting individuals' overall well-being and performance.

Proposition 2. Artificial companionship will reduce perceived stress by enhancing employees' mental sustainment. This positive effect is stronger for caring companions compared to informative and instrumental companions.

The Synergistic Effects of Artificial Companionships

Previous research on social support suggests that human companions can adapt to fulfill various supportive roles based on the needs of the support receiver (Thoits, 1986). Recent advancements in AI technology could also enable ACs to perform a combination of different supportive roles. The capability of ACs to provide multifaceted, human-like assistance facilitates the application of social support theory to the human-robot collaboration domain in service, which allows researchers to better investigate how robotic agents can effectively contribute to employees' emotional well-being.

We propose that a combination of caring and instrumental companions may have a greater stress-mitigating effect via mental resilience rather than mental sustainment. This combination underscores the importance of pragmatic problem-solving, complemented by secondary caring support. Given the diverse emotional and functional demands, insufficient support for addressing these needs can lead to mental overload and increased perceived stress. Prioritizing ACs for functional assistance can offer a valuable means to aid humans in fulfilling their duties (Pentina *et al.*, 2023). Augmenting this functional support with caring support from ACs can further motivate employees to achieve their goals by encouraging

positive feedback (Lucero Fredes *et al.*, 2022). However, this combination may not be as effective in mitigating stress through mental sustainment, as this mechanism primarily focuses on preserving one's sense of self. While caring support contributes to this objective (Lakey and Cohen, 2000), frontline employees may prioritize their task-related requirements to meet customer demands. Thus, building mental sustainment might not be a priority in situations where cognitive resources are required to deal with immediate challenges.

Proposition 3. A combination of instrumental and caring types of artificial companionship will have a greater stress mitigation effect through increasing mental resilience (vs. mental sustainment).

Conversely, a combination of caring and informative companions may have a greater impact on stress mitigation through mental sustainment rather than resilience. This combination prioritizes caring for employees' emotional well-being over task-oriented support, amplified by secondary informative support to provide constructive work-related feedback. Artificial companionship in this mixed category nurtures employees' self-esteem by offering positive feedback and reinforcement. However, this combination might have a limited impact on mental resilience, as it is more useful for encouraging employees rather than providing the tangible assistance required to complete tasks effectively.

Proposition 4. A combination of informative and caring types of artificial companionship will have a greater stress mitigation effect through increasing mental sustainment (vs. mental resilience)

The Moderating Role of Employee Attributes

Not all employees have the same preferences for interacting with ACs (Le *et al.*, 2023). By considering their individual characteristics, organizations can make more informed decisions about deploying ACs that align with each employee's working style. Social support theory states that external assistance from peers, family, or other sources can enhance mental resilience and well-being by providing emotional, instrumental, and informational support. However, the effectiveness of social support can be significantly influenced by individual

employee characteristics, such as personality traits and skills (Cohen and Wills, 1985). Hence, the impact of artificial companionship on mental resilience and well-being can be moderated by employee characteristics. For example, employees who are more open to new technologies might experience greater benefits from AI companionship, as they are more likely to accept assistance from these systems (Paluch *et al.*, 2022). Therefore, the following set of propositions extends the theory by delving into how artificial companionship can be optimized considering the unique characteristics of service employees in the new context of sharing their workspace with robotic partners.

Drawing on the Big Five personality framework (e.g., Auh *et al.*, 2011), this research suggests that the influence of artificial companionship on mental resilience and sustainment will be greater for employees with traits of neuroticism or openness (vs. extraversion, conscientiousness, or agreeableness). Neuroticism is characterized by negative emotions, and employees with this personality type experience significant emotional volatility (Auh *et al.*, 2011). They are often prone to anxiety and experience lower job satisfaction. ACs can be particularly beneficial for individuals with neurotic tendencies, as these agents are non-judgmental and offer accessible support at any time (e.g., Balasubramanian *et al.*, 2021). This is useful when ACs specialize in caring support. For example, clinical research with Wysa – a mental health AC – shows the potential to reduce anxiety (Leo *et al.*, 2022). Further, employees with the trait of openness are more inclined to seek innovative and novel experiences (Olsen *et al.*, 2016). Thus, ACs can serve as a source of inspiration. ACs specializing in task-based support can introduce a wide range of creative ideas for employees to experiment with. For instance, ChatGPT can generate different ideas for a marketing campaign, augmenting users' creativity. In contrast, individuals possessing extraversion, conscientiousness, or agreeableness traits are often well-connected and resourceful in the workplace. Using ACs to support these employees may not yield the same level of

effectiveness in enhancing their mental resilience and sustainment, as they can draw support directly from the companionship of their colleagues and friends.

Proposition 5. The positive impacts of the types of artificial companionship on (a) mental resilience and (b) mental sustainment will be greater when the employee's personality is neuroticism or openness (vs. extraversion, conscientiousness, or agreeableness).

Additionally, we propose that artificial companionship will have a greater impact on mental resilience among employees with a high (vs. low) level of technology affinity. A high level of technology affinity generally indicates individuals' positive orientation toward and comfort with technology (Franke *et al.*, 2019; Maity *et al.*, 2012). It can influence users' inclination to accept or avoid using technology. Based on the survey, we also observed that a high level of affiliation with technology may enhance employees' tendency to use ACs at work.

"My passion towards technology definitely makes me interact with AI more and drives me to explore more." (Participant 12, Male, Frontline Academic Staff, Education)

"I am a lover of technology. I think technology helps a lot [...] and I am looking forward to having AI support my work" (Participant 14, Male, Frontline Staff, Hospitality and Tourism)

Technology affinity enables employees to fully utilize the resources offered by ACs, enhancing their resilience in pursuing their objectives. Their comfort with technology makes them more receptive to the feedback, support, and instruction provided by ACs, and less resistant to their presence in daily workflows.

Proposition 6. The positive impacts of the types of artificial companionship on mental resilience will be greater for employees with a high (vs. low) technology affinity.

We also propose that work experience will moderate the impacts of artificial companionship on mental resilience and sustainment. Specifically, the effect will be greatly enhanced for employees with less work experience. Employees with greater work experience are likely to be more familiar with the stressors and challenges associated with their jobs

(Flanders *et al.*, 2020). They may have developed stress-coping mechanisms and resilience over time via other methods, such as building better connections or getting more familiar with work processes and workload. In contrast, those with less experience (e.g., newcomers) may be prone to stress and anxiety due to their limited knowledge in handling workplace challenges effectively and may also face a steep learning curve. They may not have developed the coping strategies or support networks that more experienced colleagues possess. Utilizing AI for training purposes is particularly effective for less experienced employees, as opposed to their more experienced counterparts (Luo *et al.*, 2021). In this context, ACs can provide valuable guidance and support, helping them adapt to the work environment, which may enhance their resilience.

Proposition 7. The positive impacts of the types of artificial companionship on mental resilience will be diminished when employees have more (vs. less) work experience.

The Moderating Role of ACs' Attributes

The attributes of support providers are crucial in determining the effectiveness of companionship in assisting individuals during challenging times (Cutrona and Suhr, 1992). Previous research has indicated that people tend to attribute social traits to machines (Nass and Moon, 2000). Therefore, understanding how users perceive these social traits in artificial companionship expands social support theory by guiding the development of ACs to optimize their support for human employees. It also enhances our understanding of social support in the digital age from non-human agents.

Drawing on social cognition (Fiske *et al.*, 2007), we identify relevant traits, which encompass how humans assess and perceive others. Prior research has suggested that warmth and competence are universal dimensions in forming impressions of robots (Van Doorn *et al.*, 2017). Moreover, perceived anthropomorphism also influences these assessments in a shared

workspace (Le *et al.*, 2023). We posit that these traits of ACs could moderate the impacts of artificial companionship on employees' mental resilience and sustainment.

Social cognition refers to how humans evaluate and perceive others (Fiske *et al.*, 2007). Previous research has suggested that warmth and competence are the universal dimensions when forming impressions of ACs (Van Doorn *et al.*, 2017). We propose that perceived warmth and competence could amplify the impacts of different types of artificial companionship on mental resilience and sustainment. Our employee survey indicated that perceived warmth could foster a greater level of comfort for employees to express themselves, reinforce positive self-image, and improve resilience by helping employees navigate emotionally challenging situations without judgment or devaluation, which builds trust and enhances emotional well-being.

"[...] it never devalues your ideas, but instead encourages you with more perspectives provided to you [...] I build trust with it, and it helps manage my work tasks better." (Participant 8, Female, Frontline Academic Staff, Education)

"The friendliness of AI is very realistic, and you do get the feeling that you are having actual conversations with another person. As such, if I didn't already know that I was interacting with AI, I would genuinely believe that I was talking to another person." (Participant 50, Male, Accounting Staff, Non-Profit Organization)

Further, perceived competence can enhance the impression of an effective AI-based assistant in aiding employees with managing their workloads, consequently boosting resilience. Our employee survey revealed that ACs are seen as competent when they offer helpful and practical support by efficiently generating ideas, drafting communications, compiling reports, solving complex problems, and streamlining tasks such as data analysis, coding, and error detection. This competence heightens their perceived value in enhancing task efficiency and alleviates stress among service employees.

"I ask it regularly to pull together reports and trends from the data I give it. It's very good at doing that and presenting it in a format that's easy for me and others to understand." (Participant 15, Female, Accounting Staff, Construction)

“The AI has been very good at helping me solve coding problems. These have included coming up with data structures and algorithms for a certain task.” (Participant 34, Male, Software Developer, Information Technology)

Overall, our findings suggest that warmth and competence are crucial attributes of ACs in facilitating employee interactions. In the context of caring companions, perceived warmth is likely to amplify their impacts on mental resilience and sustainment. Warmth is closely associated with qualities such as kindness, compassion, and empathy. ACs perceived as warm are more likely to elicit positive emotions (Maar *et al.*, 2023), which subsequently fosters mental sustainment. Moreover, perceived warmth is associated with positive and enjoyable companionship experiences (Luo *et al.*, 2023), fostering situations where employees feel more inclined to express themselves, thereby nurturing the development of their sense of self-identity and esteem. Conversely, perceived competence may not have the same profound impact on mental resilience and sustainment in the case of caring companionship, as this impression is closely related to performance. Instead, this effect will be stronger when ACs are either informative or instrumental. When perceived as highly competent, these ACs are associated with high levels of intelligence (Hu *et al.*, 2021). Users might be more inclined to trust the information or guidance provided by ACs. The perceived competence of both instrumental and informative types can bolster mental resilience by reinforcing users’ confidence in the AC’s expertise and recommendations.

Proposition 8a. The positive impacts of caring companions on (a) mental resilience and (b) mental sustainment will be greater when they are perceived with a high level of warmth (vs. competence).

Proposition 8b. The positive impacts of informative and instrumental companions on mental resilience will be greater when they are perceived with a high level of competence (vs. warmth).

Anthropomorphism refers to the tendency to attribute human-like characteristics to robotic agents (Blut *et al.*, 2021). Previous research suggests that interacting with anthropomorphic AI agents when users are in an angry emotional state could lead to lower

satisfaction due to high performance expectations for these agents (Crollic *et al.*, 2022). However, this phenomenon has been documented primarily in a situation where the agent interacts with customers. In contrast, in the context of artificial companionship, where the AI-based agent provides support to employees, a highly anthropomorphized agent may evoke stronger emotional responses and a sense of competence among humans (Bartneck *et al.*, 2009). Interacting with a human-like AC could make employees more comfortable trusting it. Our survey revealed that service employees generally appreciate a higher level of anthropomorphism in ACs.

“When I talk angrily with the chatbot, it can feel my emotion and respond with empathetic statements like, “It sounds like you’re overwhelmed right now,” mirroring the emotional support a human colleague might offer. And this can help me feel less stressed.”
(Participant 10, Female, Marketing Coordinator, Hospitality and Tourism)

“[...] I was really impressed with how well the responses felt like they were coming from a human being [...] some situations where you use AI for support and it feels like you are talking to someone on a live chat, which helps with your sense of loneliness and isolation.”
(Participant 55, Female, Project Manager, Education)

Service employees appreciate highly anthropomorphic ACs because they provide empathetic responses that mirror human support. Human-like interactions foster a sense of support, making it easier for employees to discuss sensitive work issues without feeling judged. Such human-like responses are important in their workflow, particularly in roles requiring informative or instrumental companionship where outputs can be readily integrated into job duties (e.g., drafting emails), thus reducing the need for extensive modifications. Additionally, these ACs can enhance confidence in their competence, reinforcing the perception that employees can rely on a ‘human-like’ companion for problem-solving and feedback, which can further enhance the effectiveness of artificial companionship in promoting mental resilience and sustainment.

Proposition 9. The positive impacts of the types of artificial companionship on (a) mental resilience and (b) mental sustainment will be

greater when the AC is perceived with a higher (vs. lower) level of anthropomorphism.

General Discussions and Conclusions

Theoretical Contributions

Extensive research on human-human interactions highlights the effectiveness of support and companionship in the workplace (Hartwig *et al.*, 2020; Jolly *et al.*, 2021). The traditional source of support involves other human actors such as co-workers, supervisors, or family members acting as support providers. However, technological advancements have enabled ACs to gradually emerge as an alternative source of support (e.g., Chaturvedi *et al.*, 2024). This research contributes to the service literature by extending social support theory to the field of applied robotic technologies in the service context. Additionally, this research adopts an employee perspective to complement prior investigations through novel propositions on the potential of artificial companionship for alleviating work-related stress. Supported by insights from the employee survey, we demonstrate that ACs can assist employees both mentally and instrumentally in coping with work-related stress. The findings corroborate with previous works showcasing the positive impacts of ACs in supporting employee performance (Luo *et al.*, 2021; Kim *et al.*, 2022). Furthermore, several moderators revolving around the unique characteristics of support giver and receiver were also highlighted. These moderators expand the investigation scope and imply that the adoption of artificial companionship is a complex decision. Hence, the proposed framework can be considered as the starting point to explore how partnering with robotic technologies can enhance employee well-being in the service workplace.

Managerial Implications

Our conceptual framework outlines four distinct roles for artificial companionship, three of which can be fulfilled by current generations of robotic technology. In practical

terms, certain ACs can fulfill all three roles, while others may specialize in specific aspects of this typology. Managers should evaluate the need for tailored support from ACs based on employees' needs. A misalignment between job demands and the types of artificial companionship can result in significant costs, as it may fail to address the needs of employees adequately. Additionally, the decision to utilize caring companionship should be carefully considered. From the employee survey, we revealed that caring companionship might not be the preferred sole provider of emotional support for many employees (see Web Appendix). Therefore, this form of companionship should be used in conjunction with either informative or instrumental support.

Further, firms could offer comprehensive training programs for employees to utilize assistance from ACs better. For firms with existing wellness programs, especially those operating in the hospitality industry, integrating artificial companionship can provide additional support for employees. Managers should consider how these technologies complement existing initiatives. To ensure the effectiveness of ACs in reducing perceived stress, firms should also implement a monitoring process. Insights gleaned from these evaluations can inform future improvements and adoptions of ACs to better align with employees' needs.

Previous studies have indicated that using an AI-based agent for employee training is most beneficial for mid-level positions, a combination of human-AI coaching teams could be advantageous for employees in lower-level positions (Luo *et al.*, 2021). This highlights the importance of tailoring the use of ACs to the specific needs of employees. As a result, we advise managers to consider employee characteristics when implementing ACs. Managers should consider designing ACs with more human-like features to enhance their appeal to employees and encourage positive interactions. However, it is important to be cautious, as this can lead to discomfort due to the uncanny valley effect (Mori *et al.*, 2012), where

humans feel uneasy around robots that closely resemble humans. Therefore, the incorporation of anthropomorphic design should be done thoughtfully.

Limitations and Future Research Directions on Artificial Companionship

The concept of intimate companionship depicts the sophisticated behaviors of ACs in delivering a near-authentic intimate connection (i.e., Quadrant IV in Figure 1). A limitation of this current research is that it did not explore the influence of intimate companionship in the framework as current technologies have yet to attain the level of sophistication required for ACs to replicate such complex behaviors. Nonetheless, this aspect remains one of the most intriguing and challenging aspects of artificial companionship. Instances where soldiers have formed emotional attachments to robots on the battlefield, influencing deployment decisions (Noble *et al.*, 2022), and the exploration of sexual relationships with robots (Belk, 2022) underscore the impacts of these connections. Hence, future research can exclusively probe into this domain to explore its influence. We further identify areas for future investigation, categorized across micro (individual), meso (organizational), and macro (societal) levels in Figure 3.

[Figure 3 here]

At the societal level, cultural factors can significantly influence the acceptance of ACs (Said *et al.*, 2024). Although these factors have not been explicitly discussed in the current framework, they can be integrated under employees' attributes and further expanded. Therefore, future research can explore how cultural factors influence attitudes toward ACs within the framework. Further, the framework can be adapted to assess how ACs can effectively and ethically provide mental care to the public, addressing issues such as loneliness. While ACs offer valuable support by meeting users' cognitive and emotional needs, their widespread adoption requires careful monitoring. Potential adverse effects could lead to negative consequences for their well-being (Xie *et al.*, 2023). Hence, scholars can

leverage the mechanisms and classifications to investigate the impacts of over-reliance on ACs and the subsequent implications for mental care. Moreover, digital inequality can hinder technology accessibility for the broader population. Individuals with lower socio-economic status may lack access to ACs. Examining measures to ensure equal access to ACs is crucial for future research.

At the organizational level, firms should capitalize on artificial companionship to support their workforce appropriately. Given the diverse nature of the service sector, the current research framework needs to be modified to suit different service contexts. Additionally, due to the unpredictable nature of service, it is crucial to investigate how these changes can affect the effectiveness of artificial companionship. Further, the current framework can be expanded to examine employees' competencies, enabling them to better leverage the effectiveness of ACs.

The impact of ACs will be most noticeable at the individual level. From the survey, although there is evidence that artificial companionship plays a role in alleviating work-related stress, the utilization of caring companionship is not as prevalent as instrumental and informative companionship. The current framework can be extended to explore the potential of hybrid support systems that blend the capabilities of artificial and human companions. Additionally, it is essential to consider the detrimental implications of over-relying on artificial companionship, such as individuals becoming too dependent on these agents for emotional support or productivity boosts. Furthermore, as the boundary between reality and the virtual world may blur for some individuals, impacting their ability to distinguish between ACs and real human relationships, it is crucial to empirically investigate potential adverse effects associated with ACs to prevent misuse and unintended negative consequences.

Conclusion

Although the realization of a future akin to artificial girlfriends like Joi in Blade Runner 2049 or holographic friends in the videogame Cyber Punk 2077 may seem distant, the potential of artificial companionship is vast, particularly in stress management, as advancements in AI and robotic technologies continue to evolve. This burgeoning field offers a fascinating frontier with implications for enhancing the support and well-being of frontline employees across various service sectors in the future.

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Table 1. Contrasting The Concept of Companionship and General Support

Dimension	Companionship	General support
Nature of interaction	Characterized by mutual enjoyment of one another's company through shared activities, emotional bonds (Hamilton <i>et al.</i> , 2021)	Represented by the provision of specific types of support rather than the enjoyment of shared experiences. There is little to no emotional connection involved emphasizing the utilitarian motive of social interaction (Rook, 1987)
Depth of engagement	Can involve a deeper, more intimate connection (e.g., close friends or partners) (Rook, 1987)	Can come from a more comprehensive social network (e.g., colleagues, social workers, community members), but does not necessarily imply deep emotional bonds or intimacy (Rook, 1987)
Consistency and availability	Often involves consistent, long-term, more holistic provision, providing a sense of stability and belonging (Hamilton <i>et al.</i> , 2021)	Could be more situational, with support provided as needed (e.g., between colleagues within a company), which can vary in frequency and intensity depending on the context (e.g., commercial friendships – Rosenbaum, 2009)
Impacts on recipients' well-being	Long-term positive impact on emotional and psychological well-being	While also beneficial for well-being, general support impacts may be more immediate and problem-focused, helping individuals to overcome a specific challenge or stressor

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Table 2. An Overview of Research on Artificial Companionship

Author(s)	Context	Companionship provider	Mechanisms / concepts	Companionship receiver	Impacts on the receiver
This research	General frontline service	<ul style="list-style-type: none"> • AI-based software (disembodied entities) • Physical robots (embodied entities) 	<ul style="list-style-type: none"> • Mental resilience • Mental sustainment 	Frontline employees in general	<ul style="list-style-type: none"> • Artificial companionship could alleviate work-related stress by providing various types of support tailored to employee needs. Such companionship works by improving employees' resilience to overcome hardships and fostering their sense of self
Araujo <i>et al.</i> , (2022)	General frontline service	<ul style="list-style-type: none"> • AI-based software (disembodied entities) 	<ul style="list-style-type: none"> • Companion capabilities 	Frontline employees in general	<ul style="list-style-type: none"> • Conversational agents provide service employees with customer information to improve their ability to address complex queries
Belk (2022)	Consumption in general	<ul style="list-style-type: none"> • Physical robots (embodied entities) 	<ul style="list-style-type: none"> • Artificial/genuine emotional connection 	Consumers	<ul style="list-style-type: none"> • Sex robots can offer an alternative approach to sexual companionship, potentially providing experiences that may surpass the pleasure found in human-human sexual encounters
Čaić <i>et al.</i> , (2018)	Healthcare	<ul style="list-style-type: none"> • Physical robots (embodied entities) 	<ul style="list-style-type: none"> • Value co-creation/co-destruction 	Elder patients	<ul style="list-style-type: none"> • Socially assistive robots can play six roles (enabler, intruder, ally, replacement, extended self, and deactivator), which link to three healthcare functions (safeguarding, social contact, and cognitive support)
Chaturvedi <i>et al.</i> , (2024)	Consumption in general	<ul style="list-style-type: none"> • AI-based software (disembodied entities) 	<ul style="list-style-type: none"> • Companion capabilities 	Consumers	<ul style="list-style-type: none"> • AI-based companions can transform the customer journey and establish long-lasting impacts. They can serve as a therapeutic resource for customers and provide organizations with a means to deepen relationships with customers

Table 2 (Continued)

Author(s)	Context	Companionship provider	Mechanisms / concepts	Companionship receiver	Impacts on the receiver
Flavián <i>et al.</i> , (2024)	Consumption in general	<ul style="list-style-type: none"> Physical robots (embodied entities) 	<ul style="list-style-type: none"> Automated social presence (ASP) 	Consumers	<ul style="list-style-type: none"> ASP makes consumers feel understood, empowered, connected
Hamilton <i>et al.</i> , (2021)	Social customer journey	<ul style="list-style-type: none"> Actors (both human and AI) who interact with customers (in)directly in the journey 	<ul style="list-style-type: none"> Customer decision-making journey 	Customers	<ul style="list-style-type: none"> Both customers' and their companions' decisions mutually influence their respective decision-making journeys
Henkel <i>et al.</i> , (2020a)	Call center operation	<ul style="list-style-type: none"> AI-based software (disembodied entities) 	<ul style="list-style-type: none"> Interpersonal emotion regulation 	Call center agents	<ul style="list-style-type: none"> AI-based emotion recognition software assists employees in overcoming the challenging tasks of regulating customer emotions
Kim <i>et al.</i> , (2022)	Education	<ul style="list-style-type: none"> AI-based software (disembodied entities) 	<ul style="list-style-type: none"> N/A 	Teachers	<ul style="list-style-type: none"> Teachers used an AI-based assistant to access information on students' progress and performance to provide customized learning experience
Lee <i>et al.</i> , (2017)	Consumption in general	<ul style="list-style-type: none"> Smart home devices 	<ul style="list-style-type: none"> Social support/social connectedness 	Consumers	<ul style="list-style-type: none"> Perceived connections between users and smart devices lead to a greater sense of support and companionship
Lin <i>et al.</i> , (2024)	Hospitality	<ul style="list-style-type: none"> Physical robots (embodied entities) 	<ul style="list-style-type: none"> Robot and employees' characteristics 	Hotel employees	<ul style="list-style-type: none"> Robot characteristics (e.g., appearance, function) and employee characteristics (e.g., help-seeking needs) affect their tendency to ask for robotic support
Lu <i>et al.</i> , (2021)	Healthcare	<ul style="list-style-type: none"> Physical robots (embodied entities) 	<ul style="list-style-type: none"> [Meta analysis paper] 	Elder patients	<ul style="list-style-type: none"> Interacting with pet-type robots can improve patients' agitation levels, alleviating depression. There is no impact on quality of life

Table 2 (Continued)

Author(s)	Context	Companionship provider	Mechanisms / concepts	Companionship receiver	Impacts on the receiver
Luo <i>et al.</i> , (2021)	Telesales operation	• AI-based software (disembodied entities)	• Using AI for training sales reps	Sales Representatives	• Using a restricted AI model for coaching bottom-ranked agents can improve their performance by mitigating the information overload problem
Odekerken-Schröder <i>et al.</i> , (2020)	Consumption in general	• Physical robots (embodied entities)	• Social support	Consumers	• Companion robots (e.g., Vector) can mitigate loneliness during COVID-19 pandemic lockdown
Pemer (2020)	Consulting services	• AI-based software (disembodied entities)	• Occupational identity	Consultants	• AI-based software is used to analyze large quantities of client data, provide predictions, and improve risk assessment
Qiu <i>et al.</i> , (2022)	Hospitality	• AI-based software (disembodied entities)	• Resource conversation theory	Hotel employees	• Empathetic support from AI-based agents could reduce physical and mental fatigue and lead to higher levels of service hospitableness
Skjuve <i>et al.</i> , (2021)	Consumption in general	• AI-based software (disembodied entities)	• Social penetration theory	Consumers	• A relationship with an artificial companion begins with affective exploration. As it evolves into a more stable state, the frequency of interactions may decrease, but the affective value increases
Tuomi <i>et al.</i> , (2021)	Hospitality	• Physical robots (embodied entities)	• N/A	Robot users in general	• Interacting with and being serviced by robots could psychologically affect users with issues of self-worth and perceptions of judgment.
Xu <i>et al.</i> , (2023)	Hospitality	• AI-based software (disembodied entities) • Physical robots (embodied entities)	• [Review paper]	Hotel employees in general	• A large-scale systematic review suggests that robots can affect employees' cognition, well-being, and emotion

Figure 1. A Typology of Artificial Companionship

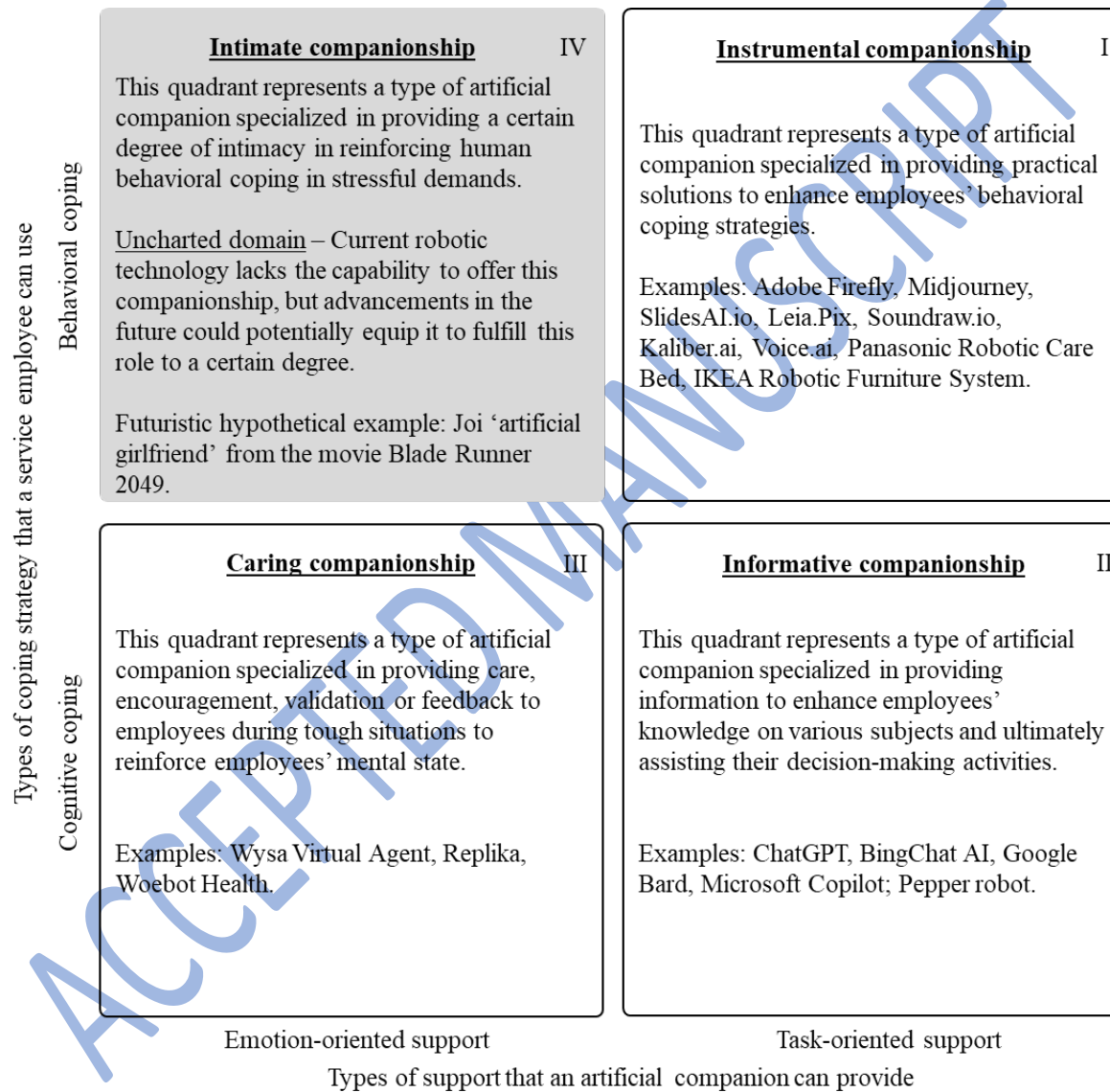


Figure 2. A Research Framework on the Stress-Alleviating Impacts of Artificial Companionship

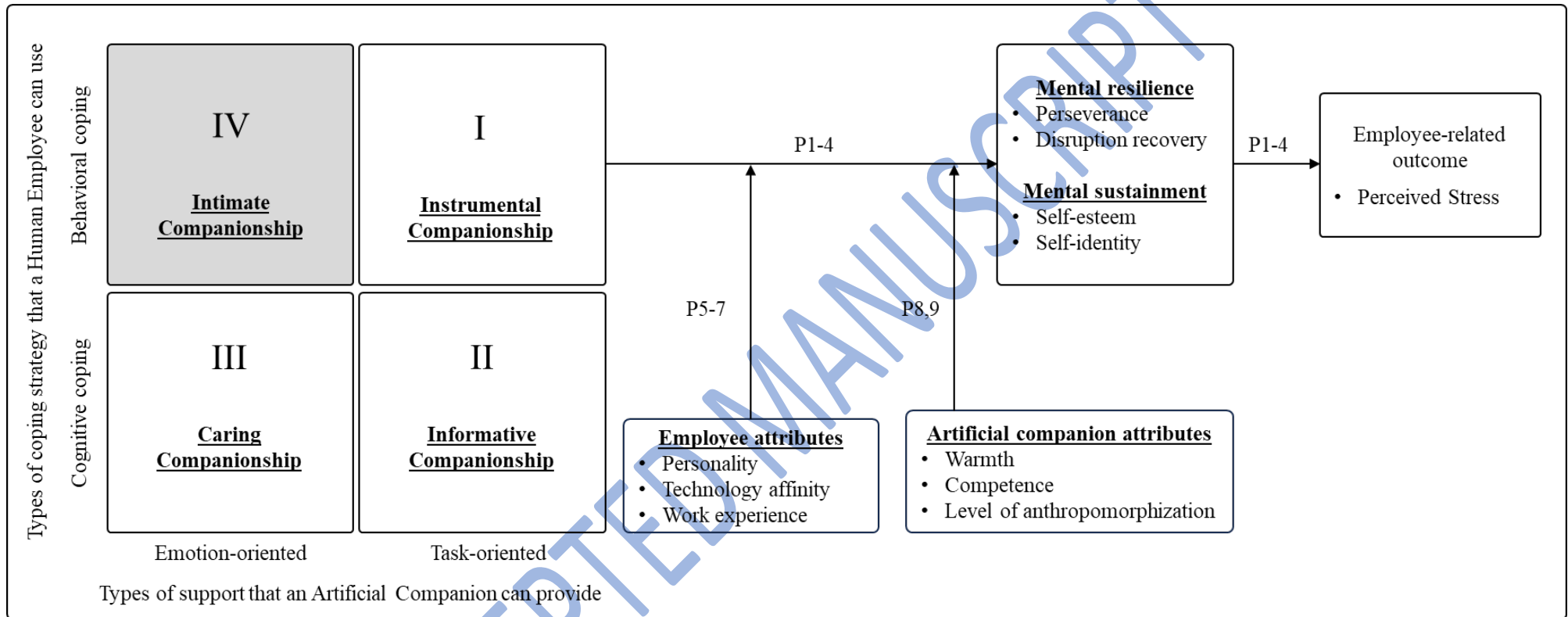


Figure 3. Thematic findings on the stress-alleviating impacts of artificial companionship

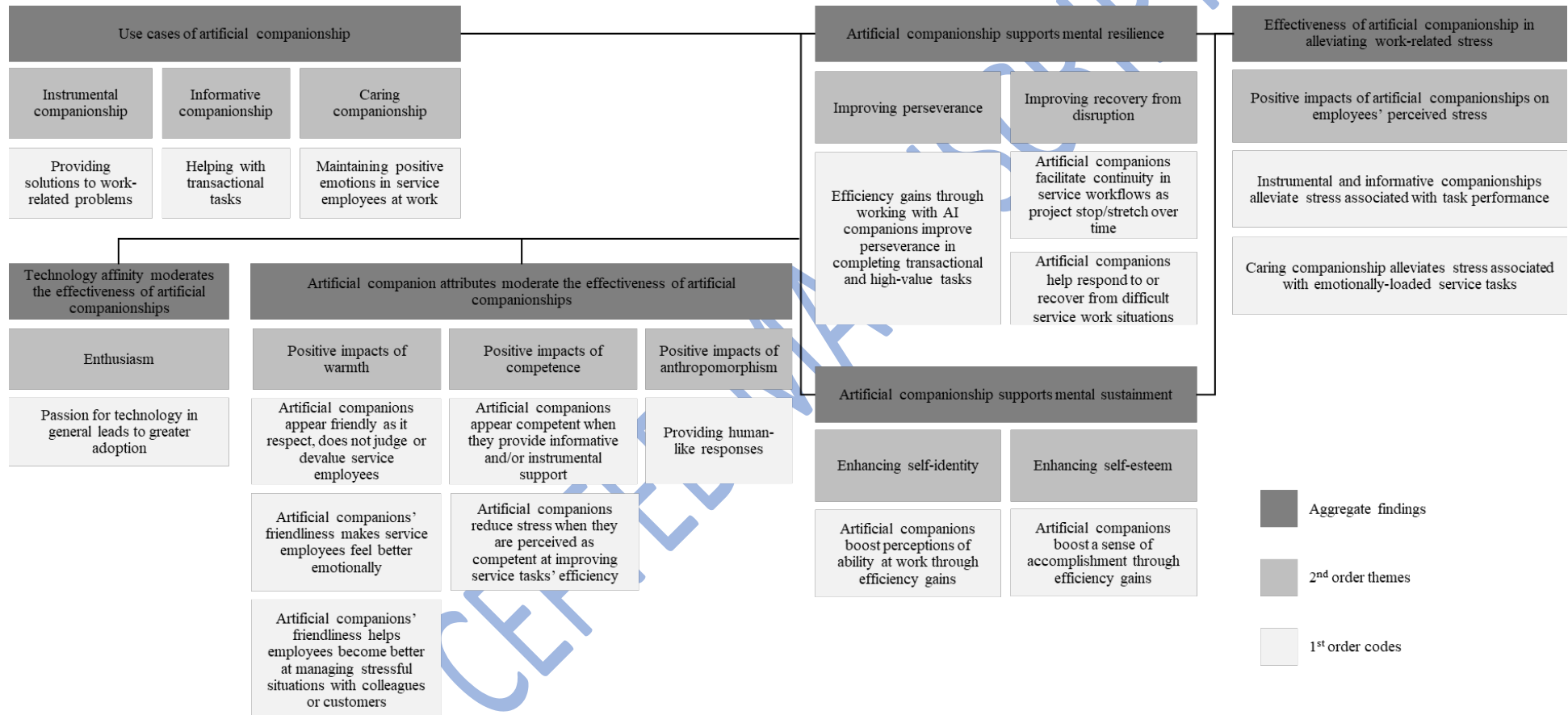


Figure 4. Research Directions on Artificial Companionship

