DEVELOPING A COBOTIC MODEL FOR EMPLOYEE AND CUSTOMER ENGAGEMENT

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Abstract

Purpose – The utilisation of artificial intelligence (AI) and service robots within organisations is perceived as a two-fold transformation. While it streamlines processes, enhances quality, and boosts profits, it also poses a threat to job security for employees, potentially leading to a reluctance to collaborate in service creation, resulting in increased turnover and reduced overall involvement. Additionally, customers may experience discomfort during interactions with service robots, leading to perceptions of poor service quality in certain instances. This study aims to explore the dynamic between robots and employees within the service sector and develop a cobotic (collaborative employee-robot model) that enhances employee and customer engagement.
Design – Three studies will be conducted to address the research questions. Study 1 will focus on research question 1, Study 2 will address research question 2, and Study 3 will address research question 3.
Methodology—Study 1 will employ grounded theory through a qualitative focus group, semi-structured interviews, and participant unstructured observations; Study 2 will use a quantitative online and on-site survey employing a scenario-based approach; and Study 3 will use a quantitative online survey employing a scenario-based approach.
Approach – This study will investigate the employee-robot relationship within the service industry, with a particular emphasis on the hospitality sector. The choice of this focus is prompted by the increasing adoption of robotics in this field and its direct relevance to the researcher's professional background.
Findings – This study's findings will address the research objectives and questions: 1. Explore the relationship between employees and robots - What is the relationship between employees and robots in the service industry? 2. Examine how employee-robot relationships can address employee engagement - How does the robot-employee relationship affect employee engagement? 3. Examine how employee-robot relationships can address customer engagement - How does the robot-employee relationship affect customer engagement?
Originality of the research – The research will contribute to engagement, artificial intelligence, human resources, and Value Co-Creation literature.
Keywords Employee-Robot Collaborative relationship; Employee Engagement; Customer Engagement; Service Robots; Value Co-Creation.

Conceptual paper
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INTRODUCTION

There is a growing concern that many jobs will be replaced by robots and artificial intelligence (AI), and future employees are required to be innovative and provide creative solutions (Rampersad, 2020). Leveraging AI, companies can transcend human limitations in information processing, facilitating innovation generation (Haefner et al., 2021). The integration of service robots into global hotel operations has surged in the last decade, aiming for cost reduction and service quality enhancement (Mariani & Borghi, 2021). The future of human-robot relationships necessitates consideration beyond the benefits robots offer but also of human factors such as skills and expertise (Verma & Singh, 2024). The term "botsourcing" denotes the substitution of human jobs with robots. Employees exhibit greater discomfort when robots replace them in jobs requiring emotion rather than cognition. Conversely, they are more comfortable when robots replace cognition-based jobs rather than those reliant on emotion. However, if robots can convey emotion, people tend to feel more at ease with botsourcing (Waytz & Norton, 2014). The future of AI in knowledge work necessitates a focus not solely on full automation but also on collaborative approaches between humans and AI (Sowa et al., 2021). In the realm of management, although augmentation and automation are intertwined, a comprehensive perspective from paradox theory is essential (Raisch & Krakowski, 2021). Limited research is investigating the triadic (i.e., customer, AI, and Employees) interactions in the AI-integrated service change (Lin et al., 2024). Future studies should explore employees' concerns about the increasing adoption of AI and AI-powered devices in the workplace and develop human resources strategies to address employees' concerns (Gursoy & Cai, 2024). Additionally, there is a demand for research on how the design of AI-powered context-aware services at various stages influences human-AI collaboration and the impacts thereof (Jiang et al., 2022). The development of artificial intelligence has changed the known methods of value co-creation (Wen et al., 2022). More research is required on AI and robots in value co-creation, how we can better understand AI and robots as actors in service ecosystems, how human-to-human differs from human-to-non-human interaction, what are the ways to enhance customer engagement through AI (Kaartemo & Helkkula, 2018). There is more focus on customers in the current literature than a few studies on employees' perspectives (Xu et al., 2023) and more quantitative than qualitative studies (Oğan, 2024). Furthermore, there is limited knowledge of how employees describe their relationship with robots, what they look for in this interaction, and how this relationship can be altered to enhance employee and customer engagement. This study will cover gaps using a mixed methods approach to develop a collaborative model between employees and robots.

Problem Definition

With heightened adoption of robots in organisations to achieve higher performance, many concerns arise regarding the intricate interplay between humans and robots and the potential for both positive and negative impacts on each party. Robots, when employed in certain manners, can evoke uncanny effects, instilling apprehension in employees about job displacement and fostering reluctance to collaborate. Studies focusing on employees' perceptions of their relationship with robots are essential at this stage to guide the future of human-robot collaboration, Furthermore, organisations and managers require scholars' guidance on developing a collaborative relationship between employees and robots to enhance employee and customer engagement.

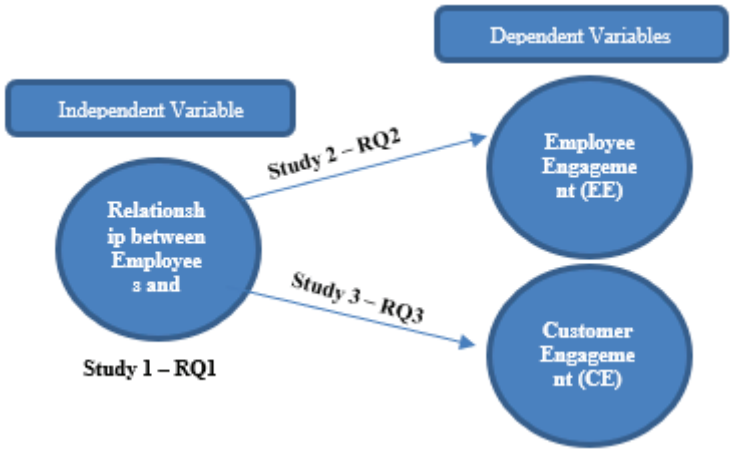
Research Aim, Objectives, and Questions

The purpose of this study is to: 1. Explore the relationship between employees and robots; 2. Examine how employee-robot relationships can address employee engagement; and 3. Examine how employee-robot relationships can address customer engagement. This study will investigate these relationships within the service industry, with a particular emphasis on the hospitality sector. The choice of this focus is prompted by the increasing adoption of robotics in this field and its direct relevance to the researcher's professional background.Top of Form A review of the literature led to the identification of the literature gap and the following research questions: RQ1: What is the relationship between employees and robots in the service industry? RQ2: How does the robot-employee relationship affect employee engagement? RQ3: How does the robot-employee relationship affect customer engagement?

Conceptual Framework

Our study comprises three main constructs. **"Relationship between employees and robots"** is an independent variable, whereas **"Employee Engagement (EE)"** and **"Customer Engagement (CE)"** are dependent variables.

Study Framework



Employee engagement is defined as "The harnessing of organisation members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances." (Kahn, 1990). Customer engagement is defined as "a psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent/object (e.g., a brand) in focal service relationships." (Brodie et al., 2011).

Significance of the Study

Value co-creation in the service ecosystem is a collaborative effort. The interaction between robots and various stakeholders elucidates the implementation, adoption, and utilisation of robots in creating value for each participant, encompassing relationships with customers, employees, management, and society (Shin, 2022). The adoption of service robots in the tourism and hospitality industry has shifted the service encounter scene from human-to-human interaction to human-to-robot interaction (Guo et al., 2024). Hospitality service employees will likely need to play the role of the enablers who support the use of service robots, as they are the ones who will work with robots side by side to enhance customer experience (Shum et al., 2024). Management scholars need to play a pivotal role in the integration of AI within organisations, necessitating a substantial shift in the current approach to AI research to develop meaningful theories and offer practical insights. This integration would not only enrich the research of computer scientists, roboticists, and engineers, who predominantly focus on automation while overlooking social and behavioural impacts, but also demands immediate attention from management scholars to delve deeper into the ramifications of human-AI interactions (Raisch & Krakowski, 2021). This study holds significance as it addresses notable gaps in existing literature, particularly in understanding the relationship between robots and employees and how to leverage this relationship to foster engagement among both employees and customers. The findings of this study are poised to significantly influence short and long-term strategies for adopting robotics in organisations. Additionally, it will contribute to the management literature by rectifying deficiencies identified in research conducted by computer scientists, roboticists, and engineers.

Theoretical Contribution

Firstly, this study will contribute to the engagement literature. Many variables impact employee engagement (EE) in the literature, such as Organisational support for technology adoption (Tavitiyaman et al., 2022) and AI service performance (Prentice et al., 2023). However, there is limited knowledge of how the Employee-robot relationship can enhance EE. On the other side, the literature mentioned variables that impact customer engagement (CE), such as Perceived value (Akdim & Casaló, 2023), and application of technology, and new technologies such as AI (Chen et al., 2021), however, there is limited knowledge on how employee-robot relationship can enhance customer engagement. Secondly, the literature highlights labour shortage and retention issues in the service industry, such as in hospitality (Kumar et al., 2024); service robot usage can address the labour shortage and retention issues, especially in remote areas. Thirdly, many studies involved value co-creation with AI and service robots, such as (Song et al., 2023); this study will extend the knowledge for the theory development by exploring the employee-robot relationship. Fourthly, the literature asks for studies on AI and service robots from a social dimension to complement the shortcomings of technical researchers (Raisch & Krakowski, 2021). This research will enrich this area by exploring how to use AI and service robots to enhance employee and customer engagement.

Practical Implications

Service robots have been introduced into hotel settings at a remarkable compound annual growth rate of 25.5%, with expectations of this trend persisting. Projections indicate that by 2030, they will encompass approximately 25% of the workforce in the hospitality sector, with an estimated market value soaring to USD 41.49 billion by 2027. This transition necessitates training around 375 million employees to undertake new tasks in light of labour automation, signifying not only a transformation in service delivery but also in workplace dynamics and employee roles (Xu et al., 2023). As the hospitality industry braces for the future, managers will increasingly need to adeptly oversee cobotic teams (Khoa et al., 2022). This study promises to furnish valuable insights for organisations progressively integrating robotics and AI into their operations. The discernments gleaned from this research will equip managers with an understanding of the intricacies underlying employee-robot interactions, offering an additional avenue to enhance both employee and customer engagement.Top of Form

Theoretical Foundation - Value Co-Creation Theory (VCC)

The theoretical foundation of this study is based on the value co-creation (VCC) theory, which establishes a connection between the three main study constructs (Relationship between employees and robots, Employee Engagement, and Customer Engagement) and guides the manner in which employee-robot co-creative collaborative relationship can address employee and customer engagement. Early-stage researchers identified two types of value: “value-in-use” and “value-in-exchange.” This distinction laid the foundation for the service-dominant logic and, subsequently, the concept of value co-creation. Customers and firms transitioned from a goods-dominant (G-D) logic to a service-dominant (S-D) logic, wherein the focus shifted to operant resources—such as skills and knowledge—rather than operand resources like tangible assets such as raw materials and machinery (Vargo et al., 2008). At the core of the service-dominant logic lies “value-in-use,” (Vargo & Lusch, 2004). To cultivate an environment conducive to value co-creation between firms and customers, Prahalad & Ramaswamy (2004a) introduced the DART concept, summarising this environment through the elements of Dialog, Access, Risk-benefits, and Transparency. The VCC framework has been extensively applied in marketing research within the domains of AI and robotics. According to Yang (2023), perceived experience and response speed serve as mediators between AI service quality and the overall co-creation experience with AI. Additionally, Song et al. (2023) observed that customers exhibit a greater willingness to co-create value with proactive SR that enhances customers’ perceptions of warmth and competence. In the tourism sector, Grundner and Neuhofer (2021) highlight that VCC occurs when AI resources understand guests’ desires and needs, offering suggestions to address issues. However, dependence on AI can potentially detract from the social value of the tourism experience, leading to a sense of isolation.

1. LITERATURE REVIEW

The current literature on HRC encompasses aspects such as trust, autonomy, roles, social rank, communication, and their impact on both employees and customers. However, there remains a scarcity of literature elucidating the relationship between employees and robots, which constitutes one of our research inquiries. Current literature has discussed the competition of collaboration for human-robot relationship (Khoa et al., 2022), the pros and cons of using service robots (Reis et al., 2020), potentialities and limitations of service robots (Rosete et al., 2020). Service robots attractiveness on customers’ emotions (Park et al., 2021), technological advancements in the hospitality industry (Drexler & Beckman Lapré, 2019), the impact of AI and robotics on turnover intentions (Khaliq et al., 2022), and roles of service robots in hospitality (Tuomi et al., 2020). Many of the mentioned studies are either conceptual or literature reviews. Our study will extend this body of knowledge using mixed methods, exploring the employees-robot relationship and developing a collaborative model to enhance employee and customer engagement.

1.1.1 Collaborative Robots

In recent times, robotics research has garnered significant attention from both academia and industry, driven by the rapid advancements in AI and the potential of autonomous iterations. This has prompted substantial investments from various industries in the development and enhancement of robotics technologies (Gracia & Perez-Vidal, 2023). Human-robot collaboration (HRC) refers to the interaction between humans and robots within an environment aimed at executing specific tasks (Ajoudani et al., 2017). Human-robot interactions encompass a spectrum of dynamics, including co-existence, synchronisation, cooperation, and collaboration. These interactions can entail the substitution, deskillling, reskilling, or upskilling of workers' skills (Dornelles et al., 2023). Robots offer the capability for supportive or substitutive automation, enabling businesses to enhance services and upgrade job roles, thereby freeing up more time for employee skill development (Tuomi et al., 2020). However, the integration of robots in the workplace can yield both positive and negative impacts on meaningful work (Smids et al., 2019). While beneficial to businesses, robots may induce negative effects on employees, such as job insecurity, reduced engagement, and resistance to their implementation (Chen et al., 2023). This can potentially lead to job turnover; however, conscientious usage of robots can enhance both work autonomy and job security, mitigating turnover intentions among employees (Zhang et al., 2023). Building on these discussions, the following hypothesis is proposed: **H1**: The relationship between employees and robots is collaborative.

1.1.2 Competitive Robots

HRC has been shown to positively influence job satisfaction, with this impact being more pronounced in scenarios where humans follow robots, potentially bolstering workers' self-esteem and self-efficacy (Pasparakis et al., 2023). However, He et al. (2023) contend that employee-robot collaboration (ERC) may engender a threat to self-esteem, leading to burnout. Moreover, the perceived intelligence of the robot moderates the indirect effect of ERC on burnout through self-esteem. Factors such as motion, predictability, task organisation, and communication patterns of collaborative robots (cobots) are critical determinants of workers' mental workload during HRC (Carissoli et al., 2023). Understanding and defining roles within employee-robot teams have been subjects of inquiry. The status of a robot co-worker can influence ERC, with higher robot status diminishing human employees' sense of responsibility, leading to an attribution of responsibility to the robot. This effect is amplified for employees with greater power distance orientation (Lei & Rau, 2021). Despite the strides made in AI and robotics, employees still harbour a preference for retaining control over robots and maintaining a higher social status than autonomous technology. Various levels of HRC are delineated based on the degree of autonomy bestowed upon the robot for task execution (Vora et al., 2024). When autonomous algorithms dictate decision-making in HRC, humans perceive it as unjust, expressing a preference for a 60-40% human-algorithm partnership (De Cremer & McGuire, 2021). This discussion informs the following hypotheses: **H2:** The relationship between employees and robots is competitive.

1.1.3. Supplementary Robots

AI-enabled service robots supplement and replace human service providers in various contexts, from fully automated baristas to delivery bots, such as in restaurants (Wirtz et al., 2023). In a service failure, human employees may need to supplement (vs. replace) the robot employees due to the effectiveness in empathy and sincerity of human-robot when apologizing (Wang et al., 2021). The relationship between function as equipment and hardship alleviation implies an employee's positive attitude to use the equipment for supplementing physically demanding work (Na et al., 2023). This discussion informs the following hypotheses: **H3:** The relationship between employees and robots is supplementary.

1.1.4. Complementary Robots

Some scholars advocate for robots to serve as complements rather than replacements for employees. For instance, the consumer-autonomous technology-worker (CAW) framework suggests that the relationship between consumers and workers is strengthened when AT augments rather than substitutes workers (van Doorn et al., 2023). Given that robots are introduced into work environments as additional entities, they inevitably impact employees' perceptions and team dynamics. Advancements in artificial intelligence (AI) can enhance the initial performance of low-performing teams but may adversely affect the performance of high-performing teams (Zhang et al., 2021). Le et al. (2022) introduced the concept of frontline employee-frontline robot interdependence (FLERI), consisting of joint goals, workflows, and decision-making authority. While human-human interaction is guided by social normative mechanisms, HRI relies solely on informational mechanisms tied to the perceived competence of the partner (Zonca et al., 2023). HRC roles have been explored from diverse perspectives. Dalmasso et al. (2023) delineated four roles within HRC: leader-follower, peer-to-peer, Master-Slave, and Leader-Leader. During task execution, subjects alternate between roles, with the higher-performing individual typically assuming the role of task leader, exerting dominance over lower-performing agents (Čamernik et al., 2022). Paluch et al. (2021) introduced the willingness to collaborate (WTC) framework, which outlines four employee personas: supporter, embracer, resister, and saboteur. Artificial emotions impact human collaborators, necessitating the selection of appropriate emotions considering their suitability and impact on humans (Urakami, 2023). Moreover, HRC holds promise in improving ergonomic working conditions (Wang et al., 2023). Consistent with this view, we offer the following hypotheses: **H4:** The relationship between employees and robots is complementary.

1.2. Employee Engagement (EE)

The employee engagement (EE) concept received the attention of industry professionals and academics (Albrecht et al., 2018). Harter et al. (2002) provided an elaborate explanation of the term "employee engagement," which denotes the level of enthusiasm, satisfaction, and involvement individuals have toward their work. EE signifies the extent to which employees within an organisation believe in, appreciate, and enjoy their work tasks. It entails a strong attachment between an employee and the organisation, leading to heightened commitment and a willingness to go above and beyond their designated job roles to support the organisation's success (Muzeyin et al., 2022). Engaged employees are individuals who fully express themselves in their job roles, demonstrated through the cognitive, physical, and emotional energies they dedicate to task performance (Lee et al., 2023).

EE is known to EEEEEE is known to affect outcomes such as, Job satisfaction (Tavitiyaman et al., 2023), Turnover intention (Asghar et al., 2021), Service delivery (Im & Cho, 2021), Employee service quality (Prentice et al., 2023), Employee job trust (Braganza et al., 2021), Relationship quality with customers (Chang et al., 2019), and Intent to remain with the organisation (Karatepe et al., 2020), EE can be influenced by numerous factors, including Polychronicity (Asghar et al., 2021), Organisational support for technology adoption (Tavitiyaman et al., 2022), AI service performance, Job security (Prentice et al., 2023), and Knowledge sharing behaviour (Khalil et al., 2021), This discussion informs the following hypothesis: **H5 to H8:** The collaborative, competitive, supplementary, and complementary relationships between employees and robots are significantly related to EE.

1.3. Customer Engagement (CE)

The concept of customer engagement (CE) has its roots in the development of customer management research (Verhoef et al., 2010). It gained prominence in the early 21st century as a crucial aspect of developing, maintaining, and enhancing both customer satisfaction and business profitability (Lim et al., 2022). The interpretation of CE varies across different contexts; within management literature, it is often perceived as an organisational activity involving internal stakeholders (Pansari & Kumar, 2016). In the realm of social commerce studies, CE is typically regarded as a unidimensional construct (Lim et al., 2022). However, in marketing, it is understood as a three-dimensional concept comprising cognition, emotion or affect, and conation or behaviour (Lim et al., 2022). This perspective views CE as the activity of customers towards the firm, often termed as customer engagement (Pansari & Kumar, 2016). The attainment of the "engagement" stage is typically associated with a satisfied relationship and emotional connection (Pansari & Kumar, 2016). Furthermore, it is acknowledged that CE can be influenced by employee engagement (Kumar & Pansari, 2016). CE is known to affect outcomes such as Customer Experience (Na Nongkhai et al., 2023), Trust, Commitment, WOM, Loyalty, Value perception (Srivastava et al., 2023), Satisfaction, Organisational profitability (Wei & Prentice, 2022), Service quality (Chang et al., 2019), and co-creation (Wen et al., 2022). Myriad factors can contribute to CE, such as Customer involvement (Srivastava et al., 2023), Customer learning and knowledge sharing (Behnam et al., 2021), Perceived personalisation, and autonomy (Wen et al., 2022), Perceived value (Akdim & Casaló, 2023), and application of new technologies such as AI (Chen et al., 2021). Accordingly, this study offers the following hypothesis: **H9-H12:** The collaborative, competitive, supplementary, and complementary relationships between employees and robots are significantly related to CE.

2. METHODOLOGY

2.1. Research Design

The research will be conducted in three studies to fulfil the objectives and address the research questions, employing a mixed methods approach encompassing both qualitative and quantitative methodologies. The initial stage (Study 1) will entail adopting a qualitative inductive approach to address the first research question and objective. This study will be achieved through grounded theory, including focus groups, semi-structured interviews, and unstructured participant observations - future studies are encouraged to test this model quantitatively. Similarly, a qualitative approach only was taken in Paluch et al. (2021) and Tuomi et al. (2020) exploratory studies. Subsequently, the second and third stages (Study 2 and 3) will employ quantitative deductive methods to address the second research question and objective (in Study 2) and the third research question and objective (in Study 3), both Study 2 and 3 will be using survey scenario-based instruments. Throughout all three studies, a standardised set of photos depicting service robots will be utilised to ensure consistency in understanding the questions. This research will focus on a service context, particularly within the hospitality sector, given its relevance to the researcher's professional background and the wide use of service robots in this sector.

2.2. Data Collection

Study 1-RQ1 - Grounded Theory (GT): Interpretivists utilise qualitative research methodologies, such as grounded theory, to delve into how participants construct meaning. GT involves researchers initiating the study to derive theory directly from the collected data, which typically includes field notes, interviews, and observations (Berryman, 2019). This methodology has found application in AI and robotics research, as evidenced by several studies (Fang et al., 2024). Triangulation represents a

widely utilised approach in mixed methods research, aiming to gather diverse and complementary data on the same topic to foster a deeper understanding of the research questions (Lundström & Lindblom, 2021). Data saturation happens in grounded theory when the categories are saturated, elaborated, and integrated into the emerging theory (Coyne & Cowley, 2006). **Study 1-RQ1** - Top of Form**Focus Group:** The initial phase (Study 1) will commence with a focus group session aimed at generating preliminary themes, followed by semi-structured interviews and workplace observations, adopting a methodology similar to that employed by Amelia et al. (2021) where it was seen as a way of obtaining richer and more complete ideas based on objective evidence, therefore generating more reliable and valid findings. The focus group will consist of six to ten participants, ensuring homogeneity in group characteristics as suggested by Cooper and Schindler (2006), facilitating a robust initiation of themes and streamlining the data collection process. **Study 1-RQ1 - Semi-Structured Interviews**: Subsequently, data collection will proceed with semi-structured interviews, each lasting between 30 to 45 minutes, drawing from the approach outlined by Galdolage (2022). It is anticipated that approximately 25 interviews will be conducted, with some followed by field observations and note-taking during and immediately after each observation, aligning with the methodology of Amelia et al. (2021). Both focus groups and interviews will offer the flexibility of being conducted either online via platforms like Zoom or Microsoft Teams, or in-person. **Study 1-RQ1 - Participant Unstructured Observations:** Participant unstructured observation is the complete form of sociological data (Becker & Geer, 1957); this will happen during the semi-structured interview stage, where the researcher will spend time with employees interacting with service robots. Participant observation has been used in hospitality studies such as in (Tuomi et al., 2021). **Study 2-RQ2 - Survey:** This phase aims to extend the developed model to address employee engagement. Surveys will be conducted with hotel employees, facilitated on-site with tablets to ensure immediate assistance for any queries, following a methodology akin to Prentice et al. (2019). Furthermore, the study will be conducted online through Qualtrics to achieve the sampling target. The survey will be scenario-based, utilising either photos or videos to convey messages to employees unfamiliar with AI and robots, a method previously employed by Lin & Mattila (2021). With approximately 30 items and a completion duration of 15 minutes, the survey will employ a seven-point Likert scale Utilising the UniSQ LimeSurvey tool contracted with UNISQ. Reliability and validity measurement items will be scrutinized via a pilot test, test-retest, alternate-form, face, content, and convergent validities. **Study 3-RQ3 - Survey:** Extending the developed model to address customer engagement, this phase will involve survey distribution through Qualtrics designed to be completed within 15 minutes with approximately 30 items; the survey will employ a seven-point Likert scale. Utilising the UniSQ LimeSurvey tool. The survey will be scenario-based, employing either photos or videos to convey messages to customers, similar to the approach used by Lin & Mattila (2021). Reliability and validity measurement items will be scrutinized via a pilot test, test-retest, alternate-form, face, content, and convergent validities.

2.3. Sampling and Measurement

Study 1: The focus group, semi-structured interviews will involve a heterogeneous sample with diverse participants representing various professional backgrounds. All study 1 methods, including participant observation, are based on purposive sampling; Participants must meet two criteria: they should have experience working with service robots and be employed in the service industry. Participant recruitment will be conducted through personal contacts and LinkedIn's professional networking platform. **Study 2:** The survey sample will comprise employees working in the hospitality industry for at least one year. Using simple random sampling, Based on available public data, about 320 million people work in hospitality worldwide, and using a sampling size calculator, we will be targeting 385 valid responses. Employee engagement will be measured using the scale developed by Willems et al. (2022) and Kumar & Pansari (2016). **Study 3:** The survey sample will consist of customers who have stayed in a hotel or dined at a restaurant within the past month to avoid false memory creation among respondents while responding to the survey questions. Using simple random sampling, Based on available public data, there will be about 1.1 billion users of hotels worldwide in 2023, and using a sampling size calculator, we will target 385 valid responses. Customer engagement will be measured using the scale proposed by Kumar & Pansari (2016).

2.4. Data Analysis

Study 1: Focus Group, semi-structured interviews, and unstructured participant observations analysis will adhere to the grounded theory approach (Fusté-Forné, 2021), involving several stages of analysis. Initially, the data will be transcribed, followed by open coding or compiling of themes. Next, axial coding or disassembling will be conducted to further refine the categories and relationships between them. Finally, selective coding or reassembling will be implemented to develop a cohesive theory based on the identified patterns and insights (Lin & Mattila, 2021). The analysis process will be conducted manually using tools such as Microsoft Excel and NVivo to facilitate data organisation and coding. **Studies 2 and 3 surveys** will also undergo Structure Equation Modelling (SEM). All analyses will be conducted using the SPSS software program.

CONCLUSION

This research investigates the relationship between employees and robots in the service industry and develops a collaborative employee-robot model for employee and customer engagement. Current research emphasizes the contrast between humans and robots, and an exciting avenue is to research how robots and humans can collaborate (Khoa et al., 2022). The research

addresses notable gaps in the existing literature on employee-robot collaboration. It provides four theoretical contributions in engagement (employee and customer engagement), human resources, value co-creation, and artificial intelligence and service robots. Mixed methods are employed to address research objectives and questions, starting with (Study 1) a qualitative grounded theory through a focus group, semi-structured interviews, and participant unstructured observations to explore the relationship between employees and robots and develop a collaborative employee-robot model addressing the first research objective and question. Subsequently, the second and third stages (Study 2 and 3) will employ quantitative deductive methods to address the second research question and objective (in Study 2), examining how employee-robot relationships can address employee engagement; and the third research question and objective (in Study 3), examining how employee-robot relationships can address customer engagement. Both Studies 2 and 3 will be using survey scenario-based instruments. This research is not exempt from limitations. Firstly, the study is conducted mainly in hospitality; future research can compare the results to other service industry contexts, such as in hospitals and banks. Secondly, the first research objective and question is developing a collaborative employee robot model using qualitative methods. Further studies are encouraged to test the explored model and hypothesis quantitatively. Thirdly, future research can collect longitudinal data because collaboration between humans and robots is a relatively new phenomenon. This study provides valuable insights for organisations progressively integrating robotics and AI into their operations, which impacts their short and long-term strategies. The discernments gleaned from this research equip managers to understand the intricacies underlying employee-robot interactions, offering an additional avenue to enhance employee and customer engagement.

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