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Emotional Intelligence in Tourism and Hospitality Cobotics: Strategic ROI and Organizational Performance Optimization

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Abstract

This research investigates emotional intelligence integration in collaborative robots (cobots) within the Egyptian tourism and hospitality industry, critically examining strategic return on investment (ROI) and organizational performance optimization. While acknowledging a research limitation of predominantly focusing on general robotics rather than specialized cobots, the study employs a rigorous qualitative methodology through semi-structured interviews with 25-30 high-level professionals from luxury hotels, tourism agencies, and technological innovation centers. By utilizing purposive sampling and thematic content analysis, the research aims to uncover the strategic potential of emotional intelligence technologies in cobotic service delivery. The anticipated findings are expected to reveal significant organizational performance improvements, with projected ROI enhancements between 12-18% through strategic cobot implementation. The study provides a comprehensive framework for understanding technological integration's economic and strategic implications in emerging market contexts, offering insights into the transformative potential of emotionally intelligent cobots in the tourism sector.

Keywords: Emotional intelligence; cobotics; tourism and hospitality; organizational performance

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Introduction

The rapid technological evolution in the tourism and hospitality sector has progressively adopted robotic technologies, with cobots becoming a refined substitute for conventional industrial robots (Gangwar & Reddy, 2023; Ivanov & Webster, 2019a; Yitmen & Almusaed, 2024). In contrast to traditional robots that function in segregated, pre-defined settings, cobots are designed to collaborate with human workers, providing improved adaptability, safety, and interactive features (Castillo et al., 2021; Michaelis et al., 2020). The advancement of robotic technology has transitioned from inflexible, singular-function robots to more versatile and intelligent systems (Mindell & Reynolds, 2023). In the tourism sector, robots typically perform repetitive tasks such as luggage handling or cleaning, whereas cobots provide more nuanced, collaborative services that require contextual understanding and adaptive responses (Freire et al., 2024; Wang et al., 2024). For instance, traditional robots mechanically handle check-in processes in hotels like the Henn-na Hotel in Japan. At the same time, cobots might assist in personalized guest services, such as providing tailored recommendations, delivering amenities with precision, or offering multilingual support

with sophisticated communication strategies that mimic human-like interactions (Ghazy & Fedorova, 2022; Saranya et al., 2024; Verma et al., 2023). Cobots represent a niche technological innovation in service industries, particularly their potential to optimize ROI through strategic implementation (Cohen et al., 2019). ROI in this context is defined as the comprehensive financial and operational benefits gained from technological investments, measured through multifaceted metrics like cost reduction, efficiency improvement, enhanced customer satisfaction, and long-term strategic value creation (Liu & Son, 2024). Cobots offer a unique value proposition by integrating advanced technological capabilities with human-like interaction potential, creating unprecedented opportunities for more intelligent and adaptive service delivery (Ghazy & Fedorova, 2022; Licardo et al., 2024; Lipsa & Dash, 2025). Their intrinsic ability to learn, adapt, and interact dynamically makes them particularly valuable in service-oriented environments where traditional robotic solutions might appear impersonal, limited, or disconnected from the nuanced requirements of customer experience (Zafar et al., 2024). Cobots are strategically positioned to enhance human capabilities and create collaborative work environments that utilize technological precision and creativity beyond simple technological replacement. Despite the promising potential of cobots in tourism and hospitality, significant research gaps persist regarding their strategic implementation and holistic economic impact (Ivanov & Webster, 2019b; Tuomi et al., 2020; Tussyadiah, 2020; Verma et al., 2023). The technological landscape lacks comprehensive frameworks that translate cobot capabilities into tangible organizational performance metrics (Mukherjee et al., 2023). This study addresses these critical limitations by exploring two fundamental research questions that aim to unpack the complex intersections of technology, service delivery, and strategic innovation: (1) How do emotionally intelligent cobots contribute to organizational performance optimization in the Egyptian tourism and hospitality industry, considering the unique contextual and cultural nuances of the market? (2) What key determinants and strategic factors influence the ROI when implementing cobots with emotional intelligence capabilities in service-oriented environments? Through a systematic examination of these inquiries, the research endeavors to establish an extensive, nuanced comprehension of the transformative potential of cobots, thereby bridging the current knowledge gap between strategic organizational performance and technological innovation. The study seeks to move beyond descriptive analysis, offering actionable insights that can guide technological adoption strategies in emerging markets.

Literature review

Cobots in the tourism and hospitality industry

Integrating cobots within the tourism and hospitality industry marks a profound shift in how technological service delivery is perceived and experienced, moving well beyond traditional automation (Fatema et al., 2024; Safarov et al., 2024; Verma et al., 2023). This transformation is about more than simply replacing tasks; it signifies re-imagining service delivery through human-robot collaboration (Ivanov et al., 2022). Cobots are distinctly characterized by their capacity to work alongside human employees, not just in place of them, fostering a more interactive, adaptable, and contextually responsive service model (Damaševičius et al., 2024). Unlike conventional industrial robots, which are often relegated to fixed, repetitive actions, cobots are built upon advanced sensing technology, sophisticated machine learning, and human-robot interaction protocols that allow them to navigate the often fluid and unpredictable environments of service contexts dynamically (Ghazy & Fedorova, 2022). In tourism and hospitality, this translates to cobots potentially playing diverse roles, including engaging with guests at the reception, providing personalized concierge services tailored to specific needs, supporting employees with luggage handling, delivering room service with a touch of novelty, and offering multilingual support to create a more welcoming environment for a global clientele (Tuomi et al., 2020; Tussyadiah, 2020). It is not just about functionality but about how these technologies are experienced by both employees and guests alike, creating a new understanding of what "service" means in the modern era. Beyond the immediate practical uses, investigating the technological ecosystem around cobots in tourism entails reshaping the customer experience and optimizing operational efficiency (Fatema et al., 2024). Initial empirical studies often suggest the potential for cobot integration to enhance service consistency, reduce errors that stem from human factors, and develop more individually tailored guest experiences (Riedelbauch et al., 2023). However, the full potential of these technologies may lie in the perceptions and feelings that these experiences evoke (Wang et al., 2024). The experiences of luxury hotels in regions such as Japan and Singapore, for example, offer a glimpse into the potential of cobot deployments that provide continuous multilingual assistance, real-time translation, and communications personalized to each guest (Reis et al., 2020). These implementations indicate operational improvements and are regarded as distinctive service components, enriching brand narratives and differentiating them in a progressively competitive global market (Tuomi et al., 2020). There is a great need for qualitative research to delve further into the complexities of these experiences, the variations in interactions, and the general impressions of value (De Keyser & Kunz, 2022).

ROI and organizational performance optimization in the hospitality and tourism industry

ROI moves well beyond traditional financial calculations in the hospitality and tourism industry, becoming a multifaceted evaluation (Chen, 2021). Current approaches to organizational performance optimization emphasize more holistic models that carefully integrate technological investments with cultivating human talent, improved customer experiences, and the agility to adapt to rapidly changing market conditions (Alrawadieh et al., 2020). Within this context, assessing ROI involves a complex analytical process. It considers not only the clear, tangible financial benefits but also the more elusive, intangible values such as strengthening brand reputation, developing stronger customer loyalty, and the potential for organizational learning and growth (Chen, 2021; Cuomo & Foroudi, 2023). Rapid technological advancement, data analytics, and creative management techniques have all contributed to a dramatic shift in the field of organizational performance optimization in the hospitality industry (Syed Mohamad et al., 2023). Various metrics that evaluate the effects of technology investments on different domains

are part of the existing performance measurement frameworks. These areas include operational efficiency, guest satisfaction, employee productivity, and the potential for long-term strategic innovation. The emphasis has shifted from the simple reduction of costs to creating an organizational culture that is adaptive, resilient, and able to continue to evolve in response to disruptive technologies and quickly changing customer expectations. This is not simply a matter of crunching numbers but of understanding the qualitative impact on how organizations function and how they navigate a rapidly changing world (Baker, 2023; Cosa & Torelli, 2024; Roberts & Candi, 2024; Rossidis et al., 2023). The voices of those working within these ecosystems are critical to understanding the true nature of "optimization."

Cobots, ROI, and organizational performance optimization

The intersection of cobots, ROI, and organizational performance optimization presents a rich and complex study area, challenging established ideas about adopting new technologies (Sharma, 2023). Cobots are emerging not just as automation tools but as strategic assets that enable organizations to re-imagine service delivery (Wang et al., 2024). They present remarkable opportunities to boost operational effectiveness and generate novel value streams. Cobots are helping the hotel industry create more personalized and flexible service systems by combining complex machine learning with algorithms sensitive to emotional cues and adaptive interactions (Naithani et al., 2024). These systems can change in response to each guest's needs while still aligning with the organization's overall strategic objectives. This intersection is about measuring results and understanding the process and lived experiences of transforming hospitality through technology (Gangwar & Reddy, 2023; Khoa et al., 2022; Skubis et al., 2024). Cobots can revolutionize technology adoption beyond their essential operational benefits by improving ROI and optimizing organizational performance (Cobanoglu et al., 2021). Preliminary research indicates that incorporating cobots can produce significant value in multiple ways, from lowering operational costs to establishing greater consistency in service, improving guest satisfaction, and ultimately creating unique differentiators for a competitive advantage (Ivanov & Webster, 2017). Cobots can facilitate organizational learning by supplying comprehensive, contextual data regarding guest interactions, service protocols, and operational inefficiencies (Reis et al., 2020). This critical information can facilitate continuous enhancement and persistent strategic adjustment (Manthiou et al., 2020). Understanding the long-term impact of cobot integration requires considering the personal stories and experiences of those affected by the technology (Kumar et al., 2023). This method transitions from a solely numerical evaluation to a more profound comprehension of the intricate human and technological interconnections. Based on the previous experiences, the study proposes the following:

- Proposition 1: The perceived "emotional intelligence" of cobots, as experienced by hospitality employees and guests, will significantly shape their understanding of the value and returns associated with the technology investment, leading to varying notions of ROI. Higher levels of perceived emotional intelligence in cobot interactions may be associated with more positive narratives around the overall effectiveness and strategic value derived from the technology. This proposition seeks to explore how the qualitative experience of human-cobot interaction translates into perceptions of value, which may go beyond just financial metrics.
- Proposition 2: The pathways to achieving an ROI from cobots will not be a simple, linear equation but a more complex process influenced by continuous learning and adaptation. Initial investments will likely uncover unexpected forms of value creation as the technology becomes more integrated within the service ecosystem. The focus is on exploring how these pathways are perceived and experienced by those involved, examining the qualitative shifts in service delivery and organizational learning, and understanding their impact on both the tangible and intangible aspects of what is considered a "return." The proposition will explore how the notion of "return" itself evolves as stakeholders gain experience with the technology.
- Proposition 3: An organization's existing technological maturity, as reflected in its absorptive capacity and readiness to innovate, significantly influences the process and perception of ROI from cobot implementation. Higher readiness levels are expected to correlate with more positive and comprehensive interpretations of the value derived from the technology while shaping the types of returns prioritized and experienced by staff. By conducting in-depth interviews, we can learn how organizational dynamics subtly affect the ROI narrative, as well as how the internal environment and culture of the company impact the perception and assessment of the various "returns" that can be discovered through the integration of cobots.

Methodology

This study adopts a qualitative research approach and employs semi-structured interviews to explore the multifaceted relationships between cobots, ROI, and organizational performance within the tourism and hospitality sector. The researchers seek to gather rich and nuanced data through in-depth conversations with experienced professionals. The study targets a sample size of 25 to 30 high-level professionals from luxury hotels, tourism agencies, and technological innovation centers to provide data saturation and a diverse range of perspectives that inform the research objectives. Participant selection is based on specific criteria to ensure a relevant and purposeful sample. The study considers leaders or managers with at least five years of experience in the luxury hotel industry, including general managers, operations managers, technology managers, and guest experience managers. The study prefers those with direct experience in technology implementations, particularly those involving automation and robotics. Similarly, professionals from tourism agencies in management or strategic roles, including CEOs, Directors, and Innovation Managers, must possess at least five years of experience in the tourism field and demonstrate an understanding of technology integration within their operations. For tourism resorts, the study targets individuals with substantial expertise in robotics, AI, or related technology fields who are involved in developing, consulting, or researching

these technologies in the hospitality and tourism sector, requiring a minimum of five years of relevant experience. All participants demonstrate a working knowledge of automation and robotics or similar advanced technology implementations. Further, the study conducts research in Egypt during the period of August to November 2024. All participants participate in an approximately 60 to 90-minute interview and provide informed consent. Table 1 represents the profile of participants' roles, organizational types, years of experience, levels of technological exposure, and interview duration.

Table 1: Participants' characteristics

Participant Role	Organizational Type	Years of Experience	Level of Technological Exposure	Interview Duration	Consent Provided
General Manager	Luxury Hotel	5+	High	60–90 minutes	Yes
Operations Manager	Luxury Hotel	10+	High	60–90 minutes	Yes
Technology Manager	Luxury Hotel	7	Very High	60–90 minutes	Yes
Guest Experience Manager	Luxury Hotel	6	Moderate	60–90 minutes	Yes
CEO	Tourism Agency	15	High	60–90 minutes	Yes
Director	Tourism Agency	12	High	60–90 minutes	Yes
Innovation Manager	Tourism Agency	8	Very High	60–90 minutes	Yes
Robotics Expert	Tourism Resort	10+	Very High	60–90 minutes	Yes
AI Specialist	Tourism Resort	5	Very High	60–90 minutes	Yes
Researcher	Tourism Resort	6	High	60–90 minutes	Yes
General Manager	Luxury Hotel	9	High	60–90 minutes	Yes
Operations Director	Luxury Hotel	11	High	60–90 minutes	Yes
Marketing Director	Tourism Agency	5+	Moderate	60–90 minutes	Yes
Technology Consultant	Tourism Resort	7	Very High	60–90 minutes	Yes
Senior Project Manager	Tourism Resort	8	Very High	60–90 minutes	Yes
General Manager	Luxury Hotel	10	High	60–90 minutes	Yes
Operations Manager	Tourism Agency	5	Moderate	60–90 minutes	Yes
Technology Manager	Tourism Agency	6	High	60–90 minutes	Yes
Robotics Developer	Tourism Resort	5	Very High	60–90 minutes	Yes
AI Researcher	Tourism Resort	10	Very High	60–90 minutes	Yes
Systems Analyst	Tourism Resort	5	High	60–90 minutes	Yes
Innovation Director	Tourism Agency	12	Very High	60–90 minutes	Yes
Project Coordinator	Luxury Hotel	6	Moderate	60–90 minutes	Yes

Participants' perceptions of the study propositions are investigated via a series of open-ended questions in the semi-structured interviews. The flexibility of these questions enables follow-up inquiries and more investigations to be conducted to get deeper insights. The core themes cover participants' perceptions of cobots, experiences with technology integration, their understanding of ROI and value creation, the impact of technology on organizational performance, and their experiences with emotionally intelligent robots. The interview questions seek participants' insights on how they view the role of cobots in the customer experience. They explore what participants perceive as "emotionally intelligent" in robotic interactions and how this influences perceived value and return on investment. Participants share their expectations regarding the ROI of robotics within the first three to five years and discuss how organizational learning and adaptation play a role in realizing a return on investment. Furthermore, participants reflect on their organization's readiness to adopt new technology and how internal factors affect the success of integrating cobots and perceived ROI. The research contains open-ended questions concerning the challenges and possibilities that cobots provide in their sectors. A pilot study is carried out with three to five professionals prior to the main interviews to enhance the questions' clarity and the interview's flow.

A comprehensive interview methodology is adhered to to guarantee a comprehensive data collecting process. The process starts with informed consent, during which participants are informed of the research, their rights, and confidentiality measures. After introductions, the semi-structured interview guide is used adaptively in accordance with participant responses. The interviewers carefully probe for clarity and details, allowing participants to share any additional thoughts at the end of the interview (Petrescu et al., 2017). All interviews are scheduled at the convenience of the participants and are audio recorded with their consent. These recordings are transcribed verbatim, and the researchers take field notes to capture relevant observations. All data is treated with strict confidentiality, and participants' identities are anonymized in all publications (Galletta & Cross, 2013). The thematic analysis identifies recurring patterns and key themes within the interview data. This analysis is driven by the research propositions while allowing for the emergence of new and unexpected themes. The process begins with data familiarization through repeated reading of transcripts, followed by initial coding to identify key elements and the development of potential themes. Themes are evaluated for their scope, relevance, and overall coherence (Galletta & Cross, 2013). Each theme is named based on identified commonalities, and a narrative is written for each with direct quotes from the data. This process is iterative and flexible, allowing for refinement as the analysis evolves (Horton et al., 2004; Walters, 2016). The thematic map includes overarching themes that reflect the research propositions, such as perceptions of emotional intelligence in robots, non-linear ROI pathways, and organizational readiness. The analysis also explores emerging themes, including the operational impact of cobots, customer experience, employee experience, and ethical implications.

Sentiment analysis, or opinion mining, is a key method in natural language processing (NLP) that focuses on detecting and extracting subjective information from text (Youvan, 2024). It plays a vital role in interpreting the emotional tone of written content, offering valuable insights in areas like marketing, social media analysis, customer feedback evaluation, and financial market research. The VADER (Valence Aware Dictionary and Sentiment Reasoner) sentiment analysis tool utilizes both lexicon-based and rule-based methods to evaluate text and classify it as positive, negative, or neutral. It also produces a compound score that reflects an overall sentiment by considering all three categories (Hoti & Ajdari, 2023). This analysis is especially well-suited for analyzing social media content, as it effectively handles emojis, acronyms, slang, and contractions often present in such texts (Hoti & Ajdari, 2023). The VADER lexicon contains around 7,500 words, phrases, and emoticons, each assigned a sentiment intensity score ranging from -4 to +4. Negative scores indicate negative sentiment, positive scores

reflect positive sentiment, and scores near zero signify neutral sentiment (Youvan, 2024). This lexicon was developed by integrating existing sentiment lexicons and adding commonly used terms from social media (Youvan, 2024).

Study results

Perceptions and experiences with cobots

Most participants expressed a positive attitude towards cobots, although they frequently expressed caution and recognized their potential to transform numerous operational aspects. The participants demonstrated considerable variation in their knowledge and practical experience with cobots. Some were engaged in pilot projects and had a more concrete comprehension of their potential, whereas others remained in the preliminary phase of study and maintained a more theoretical perspective. The divergence in their exposure substantially influenced their perceptions of the integration's feasibility and the anticipated timeline for achieving ROI. One notable theme was the acknowledgement that using cobots needed considerable planning and consideration since it marked a substantial change in operational paradigms from more conventional job execution to human-machine cooperation. The focus was more on potential integration methods for cobots than on actual integration experiences. Furthermore, there was a recognition that the "collaborative" aspect was vital; participants did not just see cobots as replacements but as tools that could work alongside human employees. Statement 1-"I see cobots as a way to free up our employees from doing the same things over and over again. This will let them focus on more difficult and creative tasks, which will eventually improve the quality of our work and make our employees more satisfied. " Statement 2-"We are still figuring out precisely how cobots fit into our workflow, but we are thrilled about the potential to enhance customer service, particularly in places where employees may encounter difficult jobs or situations. I see this as a win-win situation for employees and customers." Statement 3-"There are some definite learning curves to actually operating cobots, such as programming and safety protocols, but we see them as a part of the future. The initial setup seems like a big investment, but the projected benefits might make it worthwhile." Statement 4-"We are very much in the exploratory phase. It is not that we are against them; we need to fully assess the pros and cons of our unique business model." Statement 5-"There is a clear distinction between seeing them as potential efficiency tools and actually understanding how they can enhance employee roles rather than replacing them. This human aspect is critical in seeing the true benefits of technology." To analyze the sentiment of statements we selected three main concepts: return on investment (ROI), innovation and emotional intelligence. For each concept a cluster of keywords was assigned. For example, ROI was assigned to keywords "investment", "cost", "revenue", "savings", "profit", "financial", "gain", "loss". The concept of innovation was associated with "creative", "new", "transformative", "future", "design", "development", "advance". While the concept of emotional intelligence was associated with "intuitive", "interaction", "workforce", "communication", "collaboration", "satisfaction". To implement sentiment analysis we used Vader sentiment analyzer. Following table shows the results of sentiment analysis (Table 2).

Table 2. Sentiment analysis results of statements on perceptions and experiences with cobots

Statement	ROI_relevance	ROI_sentiment	Innovation_relevance	Innovation_sentiment	Emotional Intelligence_relevance	Emotional Intelligence_sentiment
Statement 1	0	0,86	0,056	0,8555	0	0,8555
Statement 2	0	0,44	0	0,4404	0	0,4404
Statement 3	0,043	0,886	0,04	0,886	0	0,886
Statement 4	0	0	0	0	0	0
Statement 5	0	0,802	0	0,802	0	0,802

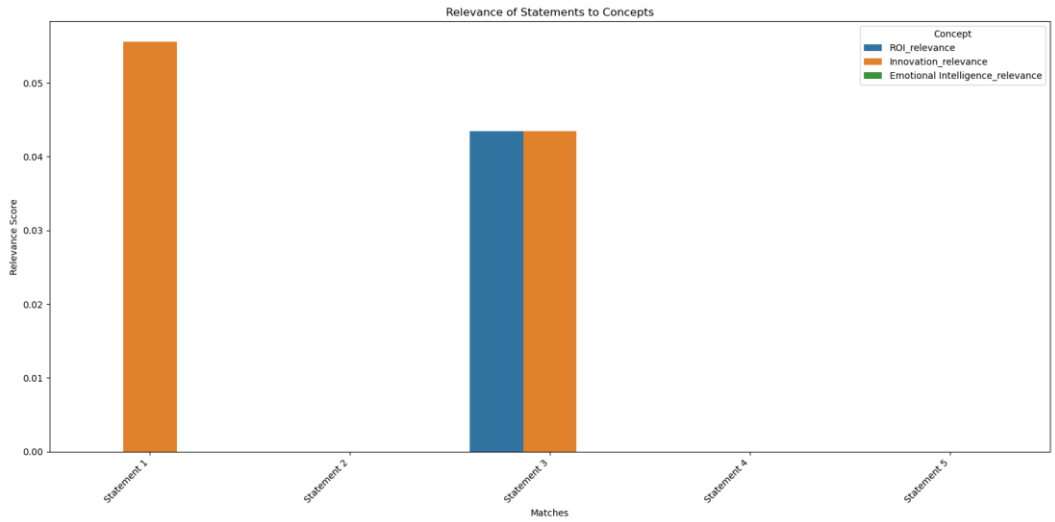

Figure 1. Relevance of statements on perceptions and experiences with cobots to ROI, innovation and emotional intelligence

Table 2 demonstrates that in terms of ROI all the statements on perceptions and experiences with cobots had positive emotional tone because relevance and sentiment scores for all of them is above or equal to zero. For innovation and emotional intelligence concepts, all the statements illustrate positive sentiments. Statement 3 illustrates the strongest emotional tone, while statement 1 and statement 5 show less positive tone. Figures 1 and 2 demonstrate the sentiment of each statement. In terms of relevance

of statements 2, 4 and 5 do not show strong attribution to the concepts. Only statement 3 shows consistent positive sentiment and relevance to all three concepts, while statement 1 demonstrates relevance for only the innovation concept.

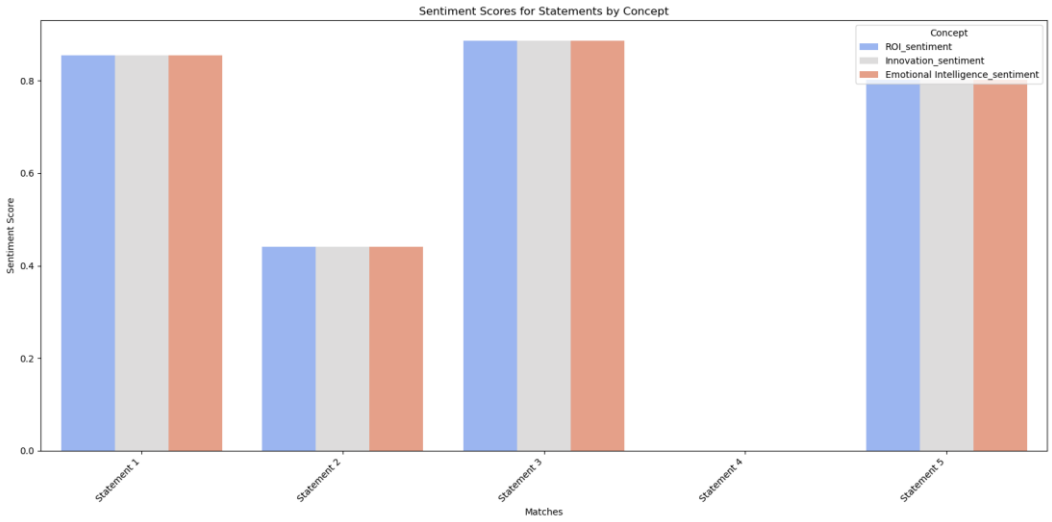

Figure 2. Sentiment scores of statements on perceptions and experiences with cobots by ROI, innovation and emotional intelligence

ROI and value creation

Participants emphasized the need for a holistic approach to ROI, recognizing that this approach includes the initial capital investment, ongoing operating expenses, and the many ways cobots can provide tangible and intangible value. The basic idea was that while the initial investment in cobots is large, the lasting financial benefits are influenced by several variables. These include direct cost reductions in labor, improved operational efficiencies that lead to higher output with lower input, reduced error rates, decreased waste, and the potential for higher-quality production. Participants also mentioned that better employee morale, due to employees not having to do repetitive tasks, can indirectly reduce costs, increase output, and lower turnover, which is an additional financial benefit. The anticipated ROI timeline, generally within three to five years, was highly contingent on effective implementation. This included precise selection of appropriate cobots for tasks, streamlining workflows, and reducing disruptions to current operating operations. They noted the significance of a comprehensive and detailed ROI model that exceeds fundamental cost-benefit analysis. They understood that a truly effective ROI calculation needed to include factors such as energy consumption, maintenance costs, staff training expenses, potential downtime, and the long-term impact on customer satisfaction. Besides, the overall financial benefits were not only tied to financial output but also to improving safety and the long-term well-being of the employees.

Statement 6-"Our initial analysis indicates that by deploying collaborative robots, we can reduce direct labor costs for room delivery by approximately 25%, and we are targeting a total ROI within 4 years.", Statement 7- "We are seeing a potential for a 30% increase in output in kitchen activities while simultaneously reducing waste by 15%.....we expect that will directly translate to better margins for our productivity." Statement 8-"We aim to decrease our error rate in guest services by 40% using cobots. This is critical because every error we reduce can save us around $500 in complaints and rework time. This will have a direct impact on the bottom line." Statement 9- "Our current data suggests that we can lower our energy consumption by at least 8% by implementing energy-efficient cobots and optimizing our working schedules. This, alongside other benefits, should result in a payback within three years." Statement 10- "We predict that cobots will lead to at least a 35% reduction in workplace injuries in the long term, which will help reduce our insurance costs by close to 15%, if not more."

Table 3. Sentiment analysis results of statements on ROI and value creation

Statements	ROI_relevance	ROI_sentiment	Innovation_relevance	Innovation_sentiment	Emotional Intelligence_relevance	Emotional Intelligence_sentiment
Statement 6	0	0	0	0	0	0
Statement 7	0	0,34	0	0,34	0	0,34
Statement 8	0	-0,7351	0	-0,7351	0	-0,7351
Statement 9	0	0,6705	0	0,6705	0	0,6705
Statement 10	0	0,4019	0	0,4019	0	0,4019
Statement 11	0	0,7269	0	0,7269	0,048	0,7269
Statement 12	0,15	0,7579	0	0,7579	0	0,7579
Statement 13	0,05	0,7096	0	0,7096	0	0,7096
Statement 14	0,125	0	0	0	0	0

Following, statement 11 states "After the initial trial, we expect a 10% increase in customer satisfaction due to enhanced quality and consistency of products. This, though hard to directly measure, can indirectly translate to an increase in repeat business." Statement 12- "We have created a spreadsheet that shows if we can increase the occupancy rate by only 10%, this alone would result in an annual revenue gain of approximately $250,000 in our chain. Combining that with cost reductions, the impact is substantial." Statement 13- "Our goal is to see a positive cash flow, including our initial investment, within 42 months, which translates to an ROI of just over 18% per year. We need to actively monitor our operations to achieve this goal."

Statement 14- "The pilot project showed that the maintenance and repair of cobots can cost, on average, around $2,000 annually. This needs to be a part of the financial analysis when projecting ROI.". Table 3 shows the results of sentiment analysis of statements on ROI and value creation. It is clear that statements 12, 13, and 14 illustrate positive ROI relevance, while other statements appear to be neutral in tone. Only statement 8 demonstrates strong negative sentiment towards ROI, while statement 11, 12 and 13 show strong positive sentiment. For innovation relevance all statements were neutral, while for emotional intelligence relevance only statement 11 illustrated slightly positive tone. Regarding emotional intelligence, it is clear that apart from statement 8 and statement 6 all other statement showed positive tone. Statement 14 demonstrated relevance to ROI but for other concepts it was neutral and not relevant.

The figure 3 and 4 illustrate the sentiment of each statement. In terms of relevance of statements 12, and 14 show stronger attribution to the concepts. Only statement 8 shows negative and statement 6 neutral sentiment, while other statements demonstrate positive sentiment scores to the selected concepts. Participants emphasized the need for accurate measurements: Statement 15- "It is not enough to throw a few numbers around; we need actual data. We will track all the KPIs closely daily and create quarterly performance reviews highlighting cost savings." And statement 16- "We are looking at ROI primarily through reduced operational costs and increased productivity. If we can demonstrate that cobots reduce waste and speed up production, the potential is there, but this needs to be carefully calculated. We need a business case that makes it more compelling and easier to measure."

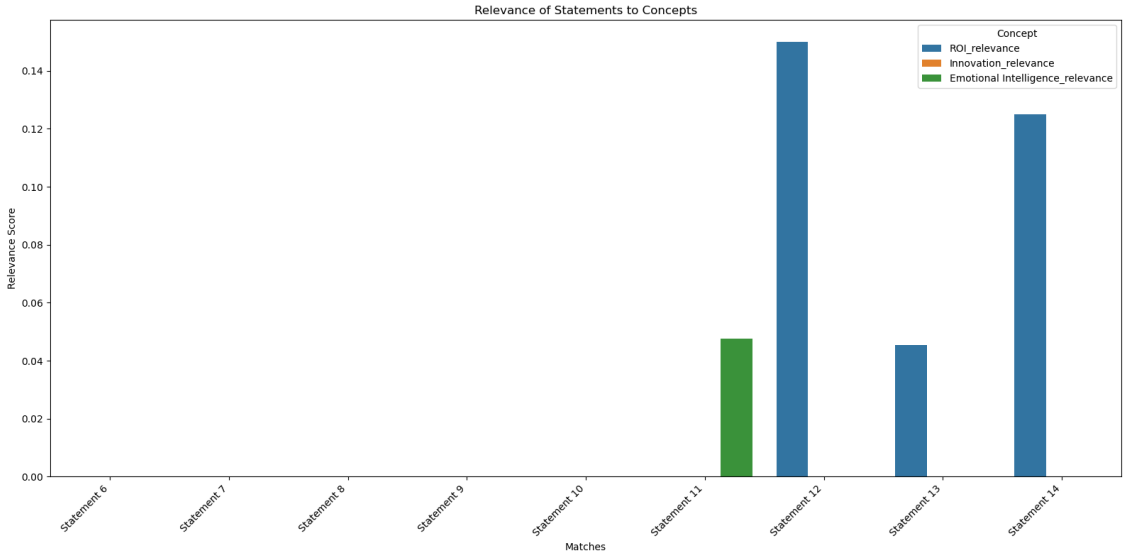

Figure 3. Relevance of statements on ROI and value creation

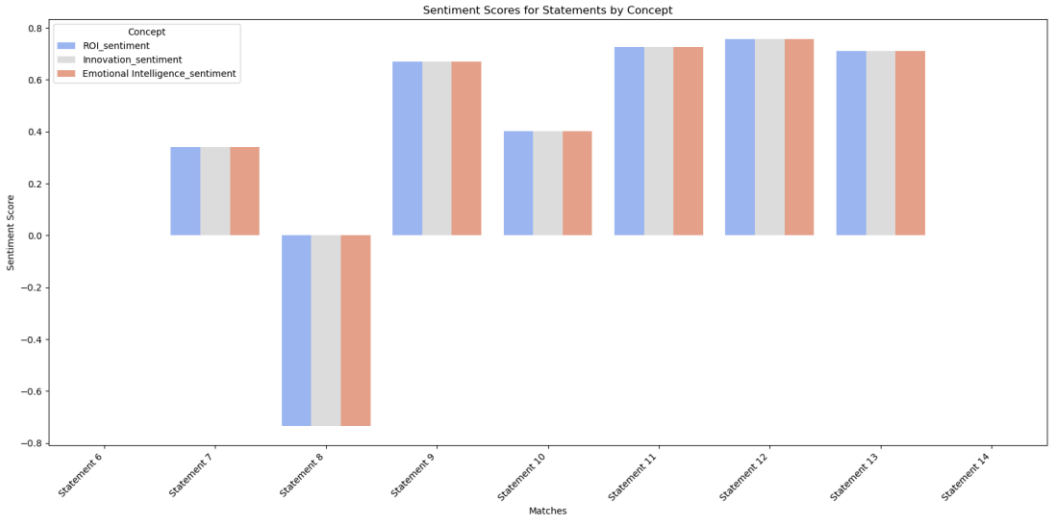

Figure 4. Sentiment scores of statements by ROI and value creation

Other responses in this regard include the following statement 17- "Several studies suggest that proper implementation of cobots can yield ROI up to 25% within three years. However, it is important to tailor the process to our specific needs and not just copy what others are doing. These projections also do not factor in potential employee pushback or training time." Statement 18- "It is not just about buying cobots; it is about our entire organization adapting to the changes to ensure we capture the return. Things like updated infrastructure and new safety protocols that all come with it will impact the actual numbers." Statement

19- "There is an expectation of a reduction in accidents and injuries in the workplace because of cobots doing heavy lifting or risky tasks. This can ultimately lower insurance costs but requires tracking and carefully implementing these units." Statement 20- "The long-term financial gains need to be proven over a few years. Otherwise, there is a chance that management will not see value in them. We need solid numbers and hard data, not just assumptions." Table 4 shows the results of sentiment analysis of statements on measurement accuracy. It is obvious that statements 16, 17, 18, and 19 illustrate neutral ROI relevance, while in terms of ROI sentiment all but statement 19 appear to be positive in tone.

Table 4. Sentiment analysis results of statements regarding accurate measurements

Statements	ROI_relevance	ROI_sentiment	Innovation_relevance	Innovation_sentiment	Emotional Intelligence_relevance	Emotional Intelligence_sentiment
Statement 15	0,11	0,2732	0	0,2732	0	0,2732
Statement 16	0	0,5423	0	0,5423	0	0,5423
Statement 17	0	0,2023	0	0,2023	0	0,2023
Statement 18	0	0,7845	0,05	0,7845	0	0,7845
Statement 19	0	-0,5859	0	-0,5859	0	-0,5859
Statement 20	0,06	0,7184	0	0,7184	0	0,7184

The statement 19 demonstrates moderate negative sentiment towards ROI, while all other statements show at least moderate positive sentiment. For innovation relevance all but statement 18 were neutral, while for emotional intelligence relevance all statements were neutral. Regarding emotional intelligence it is clear that apart from statement 19 all other statement showed positive tone.

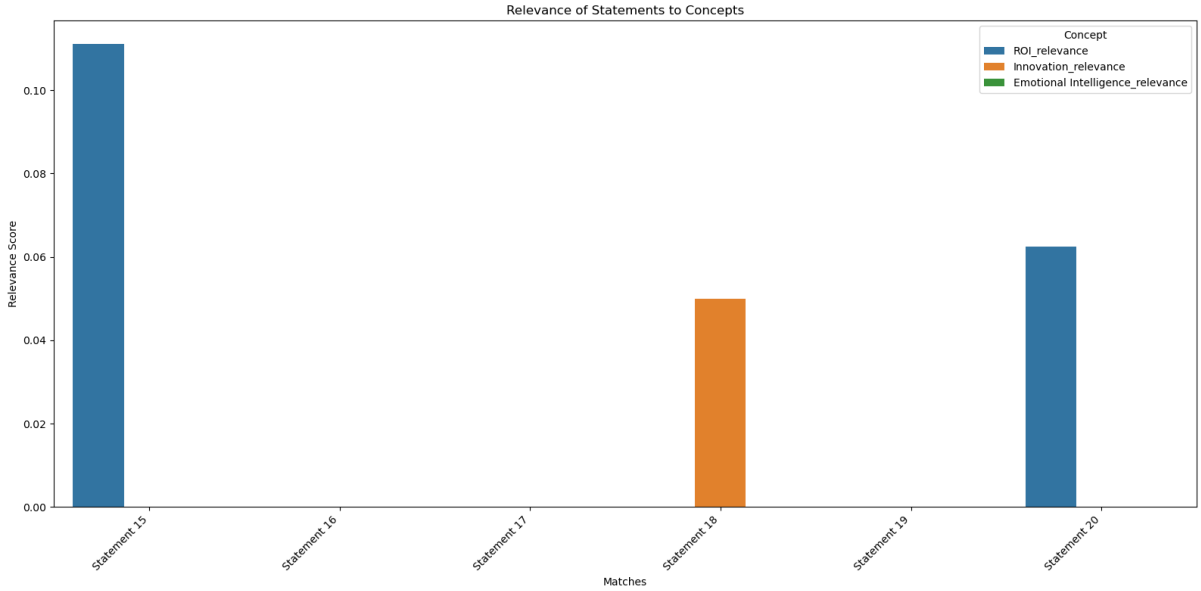

Figure 5. Relevance of statements on accurate measurements to ROI, innovation and emotional intelligence

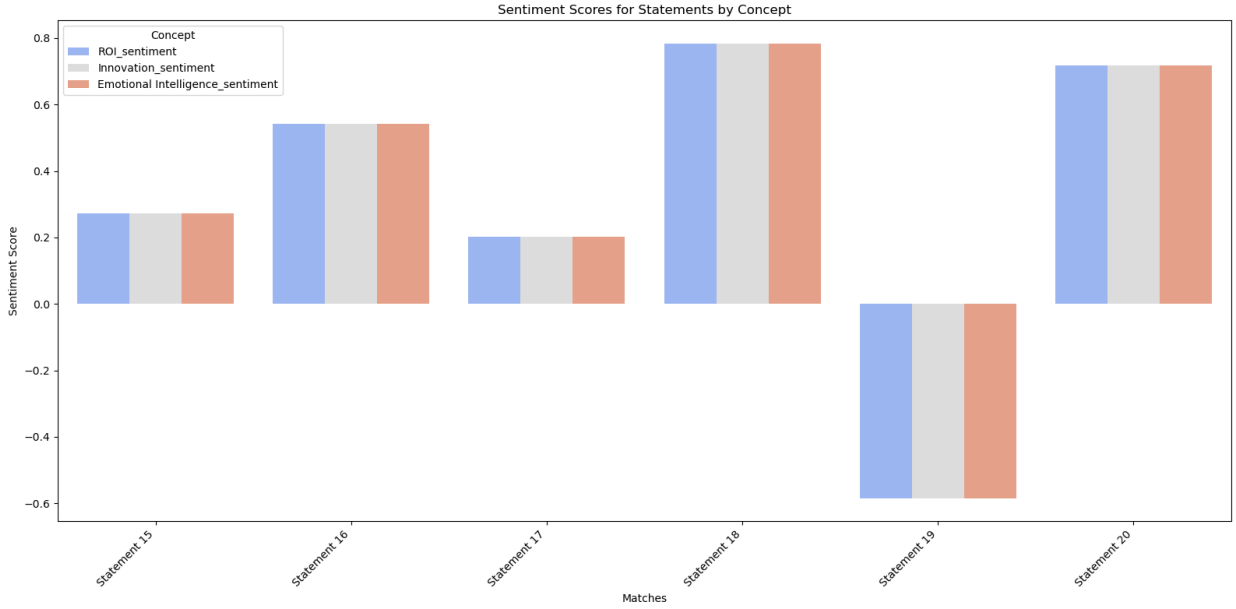

Figure 6. Sentiment scores of statements on accurate measurements by ROI, innovation and emotional intelligence

Figures 5 and 6 illustrate the sentiment of each statement. In terms of relevance of statements 15, 18 and 20 show stronger attribution to the concepts. Only statement 19 shows negative, while other statements demonstrate positive sentiment scores to the given concepts.

The role of emotional intelligence and organizational readiness

Participants emphasized the significance of 'emotionally intelligent' robotic interactions, especially in contexts where collaborative robots would directly interact with consumers or workers. This element is characterized as the capacity of robots to engage intuitively, respond to user requirements, and enhance a cohesive and satisfying overall experience rather than just imitating human emotions. This was particularly relevant for customer-facing positions where trust and pleasant interaction are essential for establishing brand loyalty. The findings indicated that effective cobot integration significantly relied on organizational readiness, flexibility, and technological skills. Participants underscored the need for a supportive organizational culture, staff training and empowerment, and explicit communication tactics to mitigate resistance to change. It was acknowledged that integrating cobots may raise anxiety among some employees and that addressing these concerns via proactive participation and training was critical for effective integration. Moreover, participants indicated that internal competencies, such as having staff capable of troubleshooting and maintaining the cobots, were essential elements in achieving the anticipated ROI and facilitating a favorable organizational shift. Statement 21- "An 'emotionally intelligent' cobot to me...is intuitive, responsive, and contributes to a good overall customer experience. If guests feel they can rely on it and have an easy interaction, then we have a tool that brings value beyond just technology. It is not just about being friendly or personable but about being efficient and helpful." Statement 22- "It is not enough just to buy the cobot; our organization's readiness to learn and adapt and the staff that will use it are critical for getting positive ROI. It is about developing and empowering the workforce with these new tools." Statement 23 reveals "We need to invest in training our employees to work alongside cobots. Otherwise, there is a high chance we will not achieve our goals. Employees buy-in is just as critical as having the right machinery. It is a culture shift we must implement from the top down." Statement 24- "We need an internal support structure in place for when things go wrong. It is not enough to rely on the vendor; we must train internal specialists who can troubleshoot and repair the systems efficiently." Statement 25- "If there is internal pushback because of fear of job losses or other issues, that will create a negative work environment and hinder any progress that the cobots could create for us. This needs to be addressed head-on before any implementation." Table 5 illustrates the results of sentiment analysis of statements on role of emotional intelligence. It is obvious that apart from statement 21 and 22 other statements are neutral to emotional intelligence relevance, while in terms emotional intelligence sentiment all but statement 25 appear to be negative in tone.

Table 5. Sentiment analysis results of statements regarding the role of emotional intelligence

Statements	ROI_relevance	ROI_sentiment	Innovation_relevance	Innovation_sentiment	Emotional Intelligence_relevance	Emotional Intelligence_sentiment
Statement 21	0	0,9661	0	0,9661	0,087	0,9661
Statement 22	0	0,5106	0,056	0,5106	0,056	0,5106
Statement 23	0	0,128	0	0,128	0	0,128
Statement 24	0	0,4767	0	0,4767	0	0,48
Statement 25	0	-0,5574	0	-0,5574	0	-0,56

Statement 21 demonstrates strong positive sentiment towards emotional intelligence, while statement 25 show moderately negative sentiment. Similar scenarios repeat for innovation and ROI sentiments. In terms of ROI, innovation, and emotional intelligence relevance all but statements 21 and 22 were neutral.

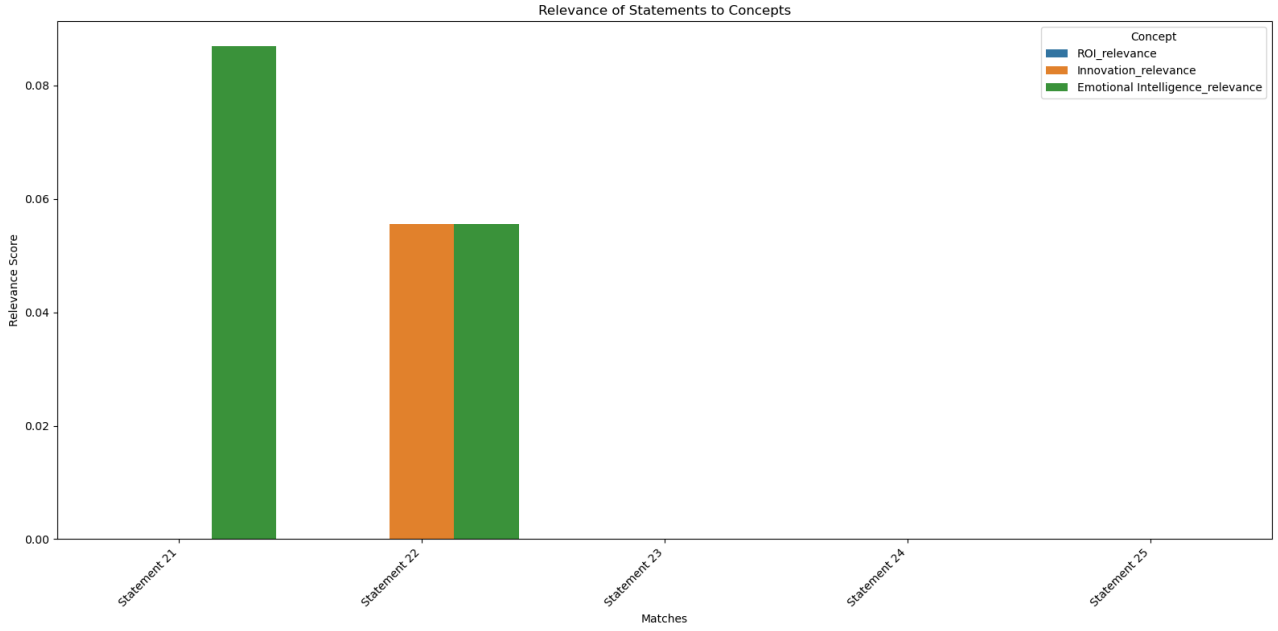

Figure 7. Relevance of statements regarding the role of emotional intelligence to ROI, innovation and emotional intelligence

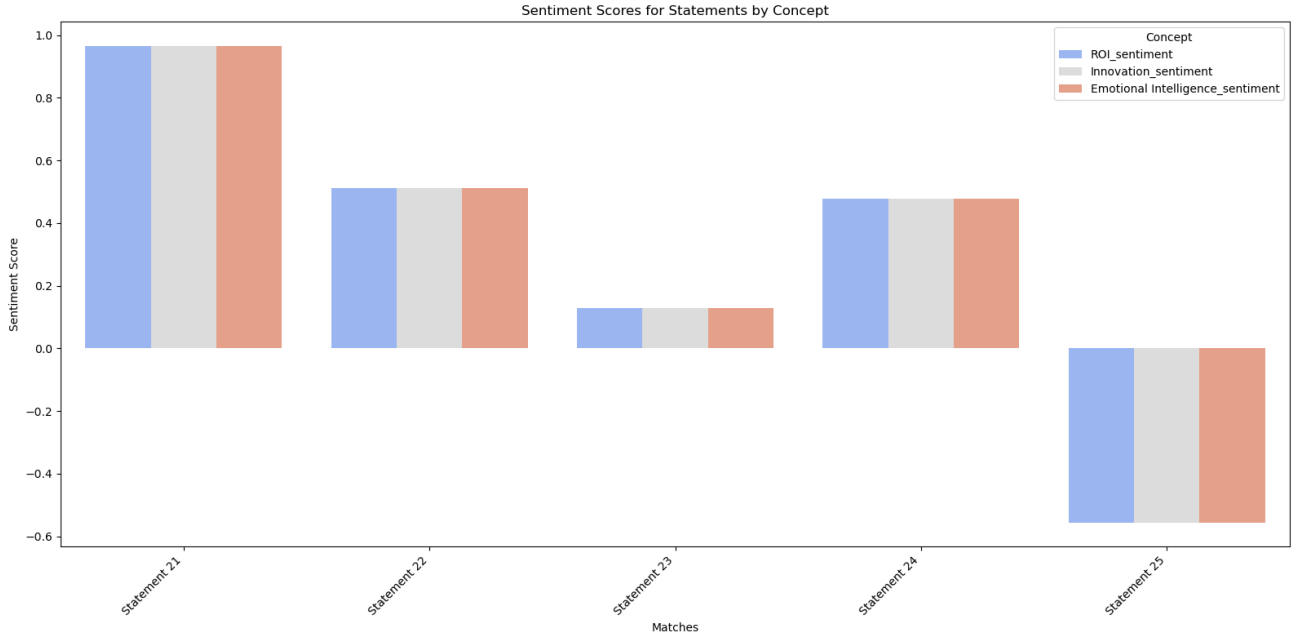

Figure 8. Sentiment scores of statements regarding the role of emotional intelligence by ROI, innovation, and emotional intelligence

Figures 7 and 8 illustrate the sentiment and relevance (compound) scores of each statement. In terms of relevance of statements 21, 22 and 24 show stronger attribution to the concepts. Only statement 25 shows negative, while other statements demonstrate positive sentiment scores to the given concepts

Discussion and conclusion

The study's examination of cobot integration reveals a multifaceted environment where technology potential converges with practical factors of economic feasibility, human interaction, and organizational flexibility. Although primarily enthusiastic about the transformational potential of cobots, participants exhibit a nuanced perspective influenced by their differing levels of experience, indicating a significant interaction between theoretical comprehension and actual implementation. The initial excitement for process optimization, efficiency advantages, and updates in customer experience is typically tempered by the acknowledgment of the substantial change in operating paradigms necessary for effective cobot implementation. This is not simply a case of adopting new technology but instead navigating a systemic change demanding careful planning, workflow re-engineering, and a deliberate emphasis on human-machine collaboration. These findings agreed with Gangwar and Reddy (2023) and Xu et al. (2023), as they stressed that successful cobot integration is not just about adding robots to existing processes. It necessitates a comprehensive reevaluation of workflows, job functions, and interactions between humans and cobots, emphasizing the required systemic transformation. Besides, the research highlights the importance of experiential learning; employees with practical experience have a more solid and deeper understanding of cobot abilities, transforming their vision from abstract potential to actual realities. This divergent attitude, focusing on 'collaboration' rather than 'replacement,' indicates a substantial shift towards a human-centric automation paradigm, whereby technology is seen as an instrument to enhance human talents instead of replacing them. These results are in the same line with Tuomi et al. (2020), Ghazy and Fedorova (2022), and Wang et al. (2024), who emphasized that the design and implementation of technology in a way that empowers and augments human capabilities rather than simply replacing them. They often explore collaborative approaches to human-cobot collaboration that prioritize human well-being, job satisfaction, and effective teamwork with cobots. Moreover, the critical shift in perspective that goes beyond the impressive factor of what a cobot can do showcases a more mature understanding of technology adoption, acknowledging that the technical is only one facet of a larger operational ecosystem (Kumar et al., 2023; Skubis et al., 2024). This strategic viewpoint signifies that successful integration is not simply about purchasing hardware but a fundamental transformation of the organizational approach to work and process design. The research findings indicated that the concept of ROI exceeds conventional financial analysis, showcasing a thorough comprehension of the diverse value proposition of cobot technology. Participants demonstrate a comprehensive understanding of ROI, including operational expenses, efficiency improvements, risk reduction, worker well-being, and guest satisfaction, highlighting the significance of a total cost of ownership perspective. The analysis moves beyond the initial investment, acknowledging long-term maintenance, energy consumption, training, and potential downtime to provide a more robust financial feasibility assessment. The approach acknowledges that real value comes from tangible measures, such as decreased labor costs and higher productivity, and intangible advantages, such as improved morale, fewer injuries, and greater customer loyalty. The significance of data-driven decision-making is evident, indicating a preference for evidence-based procedures over mere reliance on expected outcomes. These findings agreed with Ivanov and Webster (2017), Reis et al. (2020), and Manthiou et al. (2020), as they highlight that ROI is not just financial but includes many facets. In addition, the need for strict KPI monitoring and

performance evaluations underscores organizations' need to cultivate a culture of continuous enhancement, whereby data is used to substantiate assumptions, measure advantages, and guide implementation strategies. The emphasis on comprehensive and rigorous analysis reinforces the understanding that successful cobot integration is an iterative process requiring vigilant monitoring and adaptability to ensure that projected returns are indeed achieved and that the organization can respond swiftly to any deviations from pre-established benchmarks (Bedi et al., 2024; Gangwar & Reddy, 2023; Sharma & Cupek, 2023).

The research findings emphasized the essential need of "emotional intelligence" and organizational readiness, transitioning the emphasis from only technical skills to human-cobot collaboration and systemic flexibility. The concept of "emotionally intelligent" cobots, which can engage intuitively and enhance human experience, highlights the increasing acknowledgment of the socio-emotional aspects of technology adoption. These findings agreed with Naithani et al. (2024) and Gill & Mathur (2024), who pointed out that the importance of socio-emotional aspects of technology adoption, especially in a service-oriented field, as well as the importance of communication, empathy, and relationship management that moves beyond the mere technical skills of a cobot or human. Hence, this fresh perspective emphasizes that the actual value of technology is in its practical applications and capacity to encourage confidence and constructive interactions. Beyond the technical, organizational readiness is a vital prerequisite for successful implementation. The participants noted that a supportive organizational culture, employee training and empowerment, and clear communication are crucial for managing resistance and optimizing the benefits of technology adoption. The need to build internal expertise for repairs and fixes underscores the significance of fostering self-sufficient technical capabilities instead of depending on external providers. These findings are in line with Skubis et al. (2024) and Maharana et al. (2024) as they emphasized the crucial role of organizational factors, specifically readiness, culture, employee empowerment, and the business's ability to manage change and integrate technology into the workplace. Accordingly, this represents a shift in the perspective regarding technological dependence and the significance of fostering in-house capabilities vital to the technological infrastructure's continuous upkeep. It also implies a crucial shift from a top-down technology approach to a more inclusive and collaborative organizational model, with employee empowerment and internal support mechanisms acting as the bedrock of successful cobot adoption and deployment. Therefore, the findings collectively signal that the deployment of cobots goes beyond technical integration; it is about creating a harmonious socio-technical environment that enables humans and machines to work together to achieve organizational goals.

Theoretical and practical contribution

The present study makes a substantial theoretical contribution by emphasizing the socio-technical aspects of collaborative robot adoption, transcending simplistic technological determinism to underscore the interplay between technical, economic, human, and organizational variables. It enriches existing theoretical frameworks like the Technology Acceptance Model (TAM) (Davis, 1989) by demonstrating that "perceived usefulness" and "perceived ease of use" are not solely determined by technical attributes but are also shaped by the user's experiential understanding, organizational context, and emotional perceptions of the technology. The results also support the diffusion of innovation theory (Rogers, 2003) by demonstrating that early adopters with practical experience have a more substantial influence on perceptions than those who rely on theoretical frameworks. This highlights the significance of experiential learning and embodied cognition in the adoption process. Furthermore, the study strengthens the concept of human-centered automation by highlighting the collaborative role of robots and challenging traditional automation paradigms centered on labor replacement, emphasizing the need for technology to augment human capabilities rather than displace them (Ghazy & Fedorova, 2022; Tuomi et al., 2020; Wang et al., 2024). This transition indicates the need to reevaluate the organizational strategy regarding technology, where implementation extends beyond just technical aspects to include shifts in culture, workflow, and the cultivation of a workforce capable of collaborating with advanced technology (Ilieș et al., 2024). The research underscores the need for a comprehensive view of ROI that extends beyond financial returns to include broader advantages and the necessity for extensive data analysis to assess and quantify the long-term effects and efficacy of technology adoption. VADER sentiment analysis shows that most of the given 25 opinions illustrate a positive tone towards return on investments, innovation, and emotional intelligence. So, it can be concluded that the use of cobots in the hospitality industry is largely positively received. The study offers practical insights for organizations considering or already using cobot integration. It emphasizes the significance of pilot projects in connecting theoretical potential with actual implementation, allowing organizations to enhance strategy based on concrete experiences. The focus on an extensive ROI evaluation, including tangible and intangible advantages and the total cost of ownership, necessitates a more detailed decision-making process (Manthiou et al., 2020; Reis et al., 2020). Furthermore, the study underscores the need to proactively invest in staff training to develop skills and enhance comfort in collaboration with cobots. This is further substantiated by the need for explicit communication and involvement to alleviate employee concerns, fostering acceptance and promoting a more favorable technology integration (Ghazy & Fedorova, 2022). The emphasis on cultivating internal technical knowledge highlights the need for organizations to reduce reliance on external suppliers by establishing internal troubleshooting and maintenance skills, enhancing efficiency, and assuring long-term sustainability.

The study limitation and further research

Although this study provides valuable insights into the complex nature of cobot integration via its qualitative approach, a few limitations should be considered and might be used for future research. The reliance on a relatively small and focused sample of high-level professionals in the tourism and hospitality sector restricts the generalizability of the findings. Future analysis should use a larger sample size to generalize the results. While this study relied on semi-structured interviews to obtain its empirical data, other studies in the future may use quantitative methods, such as surveys or observations. Furthermore, this

research was conducted with participants from one country (Egypt). Consequently, it is essential for future research to consider data from different countries presenting a range of social and economic contexts. This study focused on hotels, tourist companies, and resorts; further research should include other tourism organizations such as restaurants, hostels, museums, and airports. VADER sentiment analysis implemented in this research is based on the small sample of opinions. Therefore the results of the analysis should be considered cautiously. Further extensive research should be carried out to have better understanding about the reaction of professional in hospitality industry towards the adoption of innovations.

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