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The Impact of Integrating Emotional Intelligence into Emerging Artificial Intelligence Systems: A Theoretical Approach

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Abstract: The recent advancements in the field of artificial intelligence (AI) and digital transformation have led to a profound shift in how individuals engage with technology. As the widespread adoption of artificial intelligence (AI) permeates all business processes, organizations face a significant challenge: seamlessly integrating artificial intelligence (AI) with emotional intelligence (EI). This intricate dynamic requires a thoughtful approach to harmonize the advanced cognitive capabilities of AI with a profound understanding of emotional nuances, thereby redefining the nature of interactions between humans and machines. Through a comprehensive theoretical approach, this article aims to provide essential insights into how EI can shape the evolution of AI systems, paving the way for a new era of artificial intelligence that is more empathetic and contextually aware.

Keywords : Emotional intelligence, artificial intelligence, technological integration, emotional artificial intelligence

1. Introduction

The liberation of individuals from manual labor has significantly enhanced our quality of life, initiating a similar transformation in the service sector within our economies. A digital revolution is taking place, comparable to the impact of the Industrial Revolution on manufacturing. Despite competitiveness challenges in markets, the potential for significant improvement in our daily lives emerges as various services, such as banking, insurance, logistics, healthcare, and education, are mechanized, streamlined, and increasingly end-to-end

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automated through this digital transformation (Bock et al., 2020a, 2020b; Bornet et al., 2021; Huang & Rust, 2018).

Today, intelligent automation (IA), service robots, and artificial intelligence (AI) are at the forefront of the service revolution, offering a potential for rapid innovation that promises to enhance customer experience, service quality, and increase productivity (Wirtz & Zeithaml, 2018). AI takes a central role as the "brain" in this transformation, defined as "algorithmic models capable of identifying patterns and learning in real-time" (Mariani et al., 2022). Beyond its traditional role in computing, AI extends into various contexts, from smartphones to recommendation systems and customer service, assuming advanced roles in fields once reserved for human intellect, such as journalism, painting, music production, and marketing (Mariani & Wirtz, 2023).

Despite the advantages of automated systems for a more interactive human resources experience, both for employers and employees, in this era of digital transformation, the real challenge arises within the sphere of analog individuals. The ubiquity of digitization has infiltrated all aspects of the professional world, and the apprehension of being overshadowed by machines persists, even among the most seasoned human resources professionals. Artificial intelligence is undertaking a crucial evolution by integrating emotional intelligence with emerging technologies.

Emotional intelligence (EI) has become ubiquitous, both at the institutional and individual levels, influencing personal satisfaction, professional development, social relationships, and workplace engagement. Its positive impact on job satisfaction, performance, and organizational engagement makes it a crucial skill, especially in the communication domains within businesses (Yao et al., 2019).

Writings on artificial intelligence (AI) have thus far focused on its technical efficiency, neglecting its emotional impact on individuals. A gap exists in understanding how AI can be linked to emotional intelligence (EI), influencing effectiveness, performance, empathy, and emotional awareness. The synergy between EI and AI is explored in this study, facilitating the analysis and assimilation of complex concepts. This research stands out by emphasizing the emotional aspect of AI, thereby bringing originality and nuance to the synthesis. However, like any study, limitations need to be considered.

2. Theoretical Foundations of Artificial Intelligence and Emotional Intelligence

2.1. What is Artificial Intelligence ?

Given the complexity of the concept and its applicability to various fields, formulating an objective and precise definition of Artificial Intelligence appears to be a challenging task (Soudoplatoff, 2018; Kerinska, 2014). According to Minsky's theory developed in 1976, artificial intelligence is defined as the creation of computer programs aimed at temporarily performing tasks that require high cognitive abilities in humans. This theory has motivated researchers by encouraging the automation of aspects of human reasoning, perception, and knowledge-related activities. In other words, it seeks to objectively and automatically replicate certain human intellectual functions.

AI can also be classified based on its evolution and applications. From the perspective of evolution, evolutionary AI includes narrow artificial intelligence, general artificial intelligence, and super artificial intelligence (Kaplan & Haenlein, 2019). Narrow artificial intelligence is the first-generation AI, applied to specific tasks (e.g., Siri, Tesla). Second-generation AI is called "general artificial intelligence," capable of autonomously solving various problems. The third generation of AI is referred to as "super artificial intelligence," expected to possess scientific creativity and social skills. Based on the range of tasks AI is capable of, Wirth (2018) classified AI into weak AI (i.e., AI tailored for specific tasks), hybrid AI (i.e., AI combining multiple solutions and capable of adapting to new tasks), and strong AI (i.e., AI as intelligent as a human and capable of handling a variety of tasks).

Kaplan and Haenlein (2019) have also divided AI into analytical AI, human-inspired AI, and humanized AI. Analytical AI uses cognitive intelligence and learning (i.e., past data) to guide future decisions and has been applied in various scenarios. Human-inspired AI possesses both cognitive and emotional intelligence. This AI system can understand human emotions and integrate them into its decision-making process. Kaplan and Haenlein (2019) indicate that human-inspired AI is becoming more popular. For instance, Walmart has utilized facial recognition tools (i.e., human-inspired AI) to identify dissatisfied customers waiting at the checkouts, enabling them to intervene (e.g., opening new checkouts).

AI is expected to possess cognitive, emotional, and social intelligence and be aware of its interactions with others. AI tools have been employed in various sectors. For example, in the retail sector, Amazon has used analytical AI to facilitate inventory management. In the entertainment field, newspapers such as the Los Angeles Times have utilized analytical AI to draft articles. In museums, AI-guided robots have been used to enhance attendance (Burgard

et al., 1999). Analytical AI in human resources management can contribute to candidate selection. In the marketing domain, AI is widely used to enhance customer service (Bolton et al., 2018; Chung et al., 2018). AI has also been deployed in contact centers to improve the customer service experience (Kirkpatrick, 2017). Despite its widespread use in businesses, the role of AI in organizations depends on the type of jobs and the level of complexity.

In general, AI is used to automate mundane and low-level tasks. Based on the four taxonomies of analytical intelligence (mechanical, analytical, intuitive, and empathic) proposed by Huang and Rust (2018), Wirtz et al. (2018) presented an intuitive understanding of service delivery based on the complexity of emotional and cognitive tasks (see Figure 1). The authors indicate that complex emotional-social tasks are likely to be performed by humans, and complex cognitive-analytical tasks are likely to be executed by robots. The COVID-19 pandemic has further increased the demand for medical service robots capable of handling contagious patients. The social robot Ari interacts with COVID-19 patients to alleviate their isolation, while other robots ensure patients receive their medications and monitor their vital signs remotely.

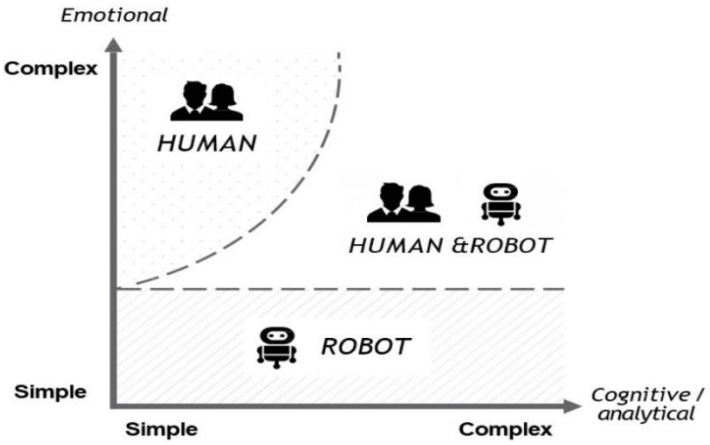

Figure 1: Service Delivery Based on the Complexity of Emotional and Cognitive Tasks. Adapted from Jochen Wirtz, Paul Patterson, Werner Kunz, Thorsten Gruber, Vinh Nhat Lu, Stefanie Paluch, and Antje Martins (2018).

Dwivedi et al. (2023) argue that generative artificial intelligence (e.g., ChatGPT) is likely to revolutionize service delivery. According to them, this technology is increasingly approaching achieving general artificial intelligence, also known as strong AI, which corresponds to the technology's ability to understand and learn any intellectual task similarly to humans. The researchers believe that generative AI will enable frontline technologies such

as chatbots, digital agents, and service robots to understand and learn virtually any intellectual task, thus surpassing the limitations of current chatbots and approaching the level of service and flexibility provided by human frontline employees. They anticipate that generative AI will become a common customer interface, providing services at a level close to that delivered by current human employees.

Service employees' roles are considered emotionally and socially complex tasks as they involve interpersonal interactions with clients (Prentice et al., 2013). This type of job requires employees to have emotional intelligence (EI) to manage these interactions (Ashkanasy & Daus, 2005). Although EI may not play a predominant role in these tasks, it is suggested that artificial intelligence (AI) could enhance these social aspects. The operationalization of AI can be done through various dimensions reflecting the quality of information and the system (Wixom & Todd, 2005), namely, reliability (degree of dependability of the system's operation), flexibility (degree of adaptability of systems to changing user demands), integrity (degree of integration of data from different sources), accessibility (degree to which information can be easily accessed), speed (degree to which systems provide timely responses to requests), completeness (degree to which systems provide necessary information), accuracy (degree to which systems provide correct information), format (degree to which information is well-presented), and update (degree to which information is up-to-date).

The aspects of AI collectively reflect employees' perception of AI quality. Previous research has demonstrated that these dimensions of information and system quality can elicit positive attitudes towards technology and facilitate employee-related outcomes (e.g., Forsgren, Durcikova, Clay, & Wang, 2016; Wixom & Todd, 2005). AI can streamline employees' work by interpreting customer queries (e.g., language translation), searching through business knowledge systems, and crafting user-friendly responses (Kirkpatrick, 2017). Additionally, AI can provide information, such as rate changes and scheduling issues. In the travel industry, Serbanescu and Necsulescu (2013) show that analytical AI can enhance task performance and increase efficiency.

2.2. Definition of Emotional Intelligence

There are various definitions and conceptualizations of Emotional Intelligence (EI) in the literature, and each of them exhibits little resemblance on its own. The theoretical paradigms underlying conceptualizations of EI emerge from one of two perspectives: as a form of pure intelligence composed solely of cognitive abilities (Mayer and Salovey, 1997) or as mixed

intelligence, encompassing both cognitive abilities and personality aspects, with differences attributed to varying beliefs about what constitutes EI (Bar-On, 1997; Goleman, 1998). Both perspectives, though different, are more complementary than contradictory. However, the competency model proposed by Salovey and Mayer (1990) represents cognitive intelligence as it is commonly popularized in the academic community and is chosen for discussion here.

Including EI within the realm of intelligence, Mayer and Salovey (1997) define Emotional Intelligence (EI) as the ability to perceive, respond, and manipulate emotional information without necessarily understanding it, as well as the ability to understand and manage emotions without necessarily fully perceiving or experiencing them. EI consists of four branches. The first branch is Emotional Perception, indicating the ability to accurately identify and express emotions and discriminate between expressions of feelings. The second branch is Emotional Assimilation, indicating emotion-focused thinking by directing attention to relevant information. The third branch is Emotional Understanding, indicating the ability to label and recognize emotions among words and the emotions themselves. The fourth branch is Emotional Management, indicating the ability to remain open to pleasant and unpleasant feelings, engage thoughtfully or detach, monitor and manage emotions in relation to oneself and others. The four branches operate hierarchically, with emotional perception being the most fundamental or lowest, and emotional management being the most complex or highest (Mayer, Salovey, Caruso, & Sitarenios, 2001). If an individual lacks the ability to process the lowest level of emotional input, they would also lack the capacity to manage emotions at the higher level described in this model. Once perception is acquired, emotions can be used to facilitate conscious or unconscious thinking.

EI has the potential to account for some of the remaining variance in predicting job performance and professional success that is not explained by traditional intelligence. Individuals with high levels of EI are more likely to experience professional success (Poon, 2004), establish stronger personal relationships (Schutte et al., 2001), lead more effectively (Gupta & Bajaj, 2017), and enjoy better health compared to those with low levels of EI (Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007).

In professional settings, EI has been found to influence a wide variety of attitudes and behaviors at work. The level of influence depends on the study contexts. EI is particularly important for frontline employees in the service industry in general and the hospitality industry in particular, as these employees hold frontline positions and have direct interactions with customers (Prentice et al., 2013). Their jobs involve a high level of emotional labor,

which can be positively moderated by EI (Kim, Jung-Eun Yoo, Lee, & Kim, 2012; Prentice et al., 2013). Research has shown that emotional labor is positively related to stress and job dissatisfaction (Lee & Ok, 2012). However, EI is positively linked to job satisfaction as it influences the ability to successfully cope with environmental demands and pressures, thereby managing stressful working conditions (emotional labor) (Lee & Ok, 2012; Prentice et al., 2013). EI also has a positive effect on employee engagement as it facilitates communication, and emotionally intelligent individuals make others feel more suitable for the work environment (Goleman, 1998; Rozell et al., 2004). It has also been found that job satisfaction and engagement are common precursors to employee retention (D'Amato & Herzfeldt, 2008; Saari & Judge, 2004).

3. Links between Artificial Intelligence and Emotional Intelligence (Emotional Artificial Intelligence

3.1. Importance of Emotional Intelligence in the Evolution of Artificial Interactions

In order to integrate Emotional Intelligence (EI) into Artificial Intelligence (AI) across various societal domains, a profound understanding of the holistic features of EI is essential. Some authors emphasize that EI, as the foundation for social cooperation and prosocial behavior, plays a crucial role in developing robots capable of maintaining positive interactions with humans (Leite, Pereira, Mascarenhas, Martinho, Prada & Paiva, 2014). EI provides the opportunity to share experiences, needs, and desires through an emotional connection with others, enabling the ability to empathize and understand another's perspective while distinguishing our own emotions from those of others. It has been demonstrated that a deficit in EI can seriously impede human relationships (Riess, 2017).

Indeed, for artificial emotional intelligence to function optimally, it needs to evolve towards a mutual approach that takes into account both sides of the exchange (Lim, Aylett & Jones, 2005). Moreover, it should adopt a cooperative approach by communicating its emotional state to promote positive interaction (Ratcliffe, 2017). Such artificial emotional intelligence must also integrate social norms and cultural aspects into its functionalities (Niculescu, van Dijk, Nijholt & Haizhou, 2014).

Anticipating the future developments of robots endowed with emotional capabilities, it becomes imperative that these emotions are authentic, adopting a form as human-like as possible. This authenticity is crucial for their successful integration into sensitive societal domains such as medicine or education.

Research on the integration of emotions in robots focuses on two distinct areas, defined as external emotional expressions and internal emotional expressions. The external aspect is related to sociability, encompassing interactions between humans and robots. In contrast, the internal aspect focuses on the development of empathic agents whose behavior is influenced by endogenous processes, regulated by emotional regulation mechanisms. The external aspect is associated with the expression of emotions without the robot actually feeling these emotions, while the internal aspect aims to genuinely create artificial emotions to make the robot empathic (Damiano, Dumouchel & Lehmann, 2015).

In summary, these two objects of study in affective computing are mutually exclusive, meaning they adopt different perspectives and approaches to implant emotional intelligence. However, despite their differences, they share a common goal: enhancing the understanding and emotional response of robots, thereby paving the way for more meaningful and empathetic interactions with humans.

3.2. Contrasting Dynamics of Emotional Intelligence in Robots

On one hand, researchers advocate for an internal approach to artificial intelligence, advocating for maximum humanization characterized by mutuality and cooperation (Ratcliffe, 2017). This perspective includes evolving emotions over time, as illustrated in the study of a receptionist robot by Kirby, Forlizzi, and Simmons (2010). The goal of this research was to create a robot model capable of developing a general mood rather than an immediate emotional response, thus fostering authentic long-term relationships.

On the other hand, studies focused on the external aspect encourage an efficient operationalization of artificial intelligence in human interactions. This encompasses the non-verbal communication of emotions, including movements, gestures, posture, and facial features (Stephan, 2015). According to the Uncanny Valley theory by Mashiro Mori, the response to a robot resembling a human would oscillate from repulsion to a positive feeling as the robot approaches a human appearance. However, this reaction can sharply decline when the robot looks almost human but not quite (Mori, MacDorman & Kageki, 2012).

This divergence underscores the challenge of finding a balance between the internal approach, emphasizing deep emotional integration, and the external approach, focused on physical communication. The lack of consensus in the external approach highlights the difficulties in replicating successful social interactions, even when concentrating on physical features. Thus, the external aspect of emotional expressions seems to refer to Frans de Waal's first doll model, embodying emotional contagion and motor mimicry, primitive traits present

in many animals. This is why the imitation of external emotional expressions remains crucial in the application of artificial emotions.

3.3. Comparison between Automated Customer Service and Traditional Service Delivery

3.3.1. Emotional Labor in the Face of Technological Innovation

Frontline employees are typically seen as the primary representation of a service-oriented company, tasked with ensuring service quality through their skills, training, emotions, personality, and attitude (Wirtz & Jerger, 2017). For service organizations, human contact can be a differentiating factor depending on the company's approach. Human interaction allows for the exchange of authentic emotions, absent in AI-based customer interfaces. The service management literature has differentiated between "deep acting," where employees display genuine emotions, and "surface acting," where employees exhibit superficial and insincere emotional responses (Wirtz & Jerger, 2017). Since AI-based service agents do not experience genuine emotions, their emotional expressions are likely to be perceived as artificial. Consumers may react differently compared to the authentic emotions expressed by human frontline employees (Wirtz et al., 2018). However, increasingly humanized and anthropomorphized AI service agents might be better at mimicking surface emotions (i.e., automated social presence) than human employees, as they are not subject to emotional exhaustion (Van Doorn et al., 2017).

3.3.2. Difference between Individual and Systemic Approach

Another distinction lies in the fact that human employees possess unique personalities, skills, perceptions, biases, and experiences, leading to variations in the quality of service provided over time and among different employees. Human employees require training to master necessary routines, memorize relevant information, and learn to use various computer systems, which can be a lengthy and complex process. In contrast, AI-based customer services are integrated into a larger system of frontline services. They can easily access information from a knowledge database, as well as external sources such as the internet and social media, to deliver their service.

3.4. Development of Emotional Artificial Intelligence

The rapid development of artificial intelligence (AI) since the 1950s has raised the question: "Can machines do what humans do?" AI technologies perform simple and limited tasks through various programs aimed at simplifying life and work. Currently, AI is capable

of detecting emotions, whether through voice or facial expressions. For instance, some AI technologies analyze voices to understand users' emotions, while others reveal emotions by analyzing subtle variations on the face. However, there is a need to further develop the recognition of complex facial expressions. Strange (2019) stated that scientists are considering transferring cognitive development processes from childhood to adolescence for AI, predicting that AI will be able to feel emotions like humans in the future. However, emotional and cognitive processes are closely linked, meaning emotions based solely on cognitive processes may deviate from reality. Ultimately, the quest for comprehensive artificial emotional intelligence continues.

Emotion-focused artificial intelligence closely examines unfiltered facial expressions using optical sensors or webcams. According to Eminoğlu (2019), it conducts real-time analysis of the human face in an image or video. Computer vision algorithms reveal key points on the human face, while deep learning algorithms analyze pixels in these regions to classify facial expressions. Finally, the combination of these facial expressions is associated with emotions.

This form of emotional artificial intelligence also extends to speech analysis, observing the tone and pitch of the voice to decipher emotions. For instance, the company Affectiva uses "facial coding and sensory identification" software to detect individuals' emotional responses to digital content while harnessing emotional AI. Solely equipped with a camera and an internet connection on the user's device, this system allows viewers of a brand's video to share their thoughts and feelings without resorting to written or verbal comments. The emotions thus collected from all participants can then be stored in a dataset and monitored statistically via a brand-owned dashboard (Eminoğlu, 2019).

Google Duplex, developed by Google, also illustrates the ability to express empathy and respond. This tool handles basic requests and interacts in a way that seems human-like, although human intervention is required for more complex requests. Apple's iPhone X, through its Face ID feature, uses animojis to privately mimic the user's facial movements. With the evolution of this technology, the user can communicate in real-time using a digital version of themselves and their physical expressions. These digital scenarios can be utilized in webinars, virtual job fairs, and one-on-one meetings (Barrett, 2019).

As artificial intelligence advances and emulates capabilities similar to humans, there is a growing expectation for its integration of emotional intelligence as a fundamental aspect.

Moreover, mastering emotional intelligence could become an essential skill for individuals in a world that increasingly values emotions, especially in the professional context.

4. Conclusion

Emotional Intelligence (EI) has become highly popular for predicting individual and organizational success. Artificial Intelligence (AI) has also made its way into the business world. Machines are being used in business, a situation referred to as transformative evolution. A thorough examination of the integration of Emotional Intelligence (EI) into emerging Artificial Intelligence (AI) systems, as presented in previous articles, reveals a complex yet promising landscape. The future prospects of this integration are inherently tied to the rapid evolution of technologies and the social and ethical implications that ensue.

The works of Lona et al. (2020) and Wu et al. (2020) highlight significant opportunities that the integration of EI offers to AI systems. The correlation between EI and key dimensions of AI suggests potential advancements in areas such as emotional recognition and more natural interactions between humans and machines. These perspectives pave the way for more advanced applications, where AI could not only process data logically but also integrate emotional elements, thereby enhancing understanding and adaptation to human needs.

However, it is imperative to consider the inherent limitations of this convergence. Concerns raised by Huang and Rust (2018) regarding social implications, particularly in terms of employment, underscore the need for careful management of this technological transition. The potential replacement of low-skilled jobs by automated systems raises complex questions related to economic equity and access to the benefits of these technologies. This tension between technological opportunities and social consequences requires thoughtful consideration to ensure an ethical and fair transition.

Furthermore, although studies such as those by Ertaş and Kıraç (2019) and Prentice et al. (2020) highlight significant relationships between EI and specific aspects of AI, there are still areas of ambiguity in our overall understanding. Future research should focus on clarifying the precise mechanisms of interaction between EI and AI. In particular, the need to assess the ethical implications of these technological advancements should be at the forefront of concerns, taking into account insights from previous studies.

In conclusion, the integration of EI into AI systems presents exciting prospects but requires careful management of social and ethical implications. Future advancements in this

field should focus on a thorough understanding of the interactions between EI and AI, proactively addressing limitations and seeking ethical solutions to guide the responsible development of this emotional and technological convergence.

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