



The human-AI dyad: Navigating the new frontier of entrepreneurial discourse

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ABSTRACT

The rapid progression of Artificial Intelligence (AI) is further solidifying the importance of redefining entrepreneurship and reshaping how ventures and innovations are conceived, developed, and managed. This paper investigates how AI is transforming entrepreneurship by reshaping traditional business paradigms and entrepreneurs' roles. It examines AI's influence on entrepreneurial decision-making, innovation, and identity. Through a comprehensive literature review and thematic analysis of previously published data, the research identifies emergent themes in AI's integration into entrepreneurial discourse. The findings indicate that AI enhances operational efficiency and decision-making but challenges traditional notions of entrepreneurial identity and creativity. Furthermore, entrepreneurs increasingly depend on AI for data-driven insights, strategic foresight, and personalised customer interactions, reshaping business strategies and competitive landscapes. This article emphasises the importance of AI literacy and adaptive strategies for entrepreneurs to leverage the human-AI dyad effectively while maintaining values and ethics. It also highlights the significance of concentrating research efforts on entrepreneurs as they are the very cohort to shape new norms and pioneer new business models and innovations. Future research should explore AI's long-term impacts on entrepreneurial ecosystems, including psychological, ethical, and socio-cultural dimensions, with comparative studies across industries and regions providing further insights.

1. Introduction

The future of entrepreneurship dawns; it is unlike anything we have known before...²

Artificial intelligence (AI) is one of the earliest and most expansive fields in computer science, focusing on replicating cognitive functions for real-world problem-solving and creating systems that can learn and reason similarly to humans. This field is frequently termed machine intelligence (Seng et al., 2023), in order to distinguish it from human intelligence (Gruetzemacher et al., 2022); yet, oddly, there is no universally accepted definition of AI (Ng et al., 2021). To address this gap, Gil de Zúñiga et al. (2023) systematically reviewed the literature to create a multidisciplinary working definition of artificial intelligence: *"the tangible real-world capability of non-human machines or artificial entities to perform, task solve, communicate, interact, and act logically as it occurs with biological humans"* (p.317). The author mirrors this definition when referring to AI.

To explain its unparalleled ability to self-learn, self-analyse, and adapt, AI has been characterised by its ability to process vast

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² Quote from Dr Faith Jeremiah regarding the impact of artificial intelligence on entrepreneurs.

amounts of data, learn from patterns, make predictions, automate routine tasks, and augment human decision-making capabilities to unprecedented levels, blurring the lines between human and AI capabilities (Monett & Lewis, 2018). More recently, integrating Artificial Intelligence (AI) into the business domain stands as a transformative force reshaping entrepreneurship, strategy, market dynamics, and consumer expectations (Gruetzemacher & Whittlestone, 2022; Pávoloaia & Necula, 2023). This paradigm shift challenges traditional notions of entrepreneurial practice and prompts a re-evaluation of the role of entrepreneurial agency in the digital age.

As AI continues to evolve, especially in its capacity to analyse and imitate the expected behaviour of entrepreneurs (Guzman & Lewis, 2020), it incites a revolutionary shift in the landscape of innovation, identity, and business practices. This crossover of AI into the entrepreneurial domain becomes a vital discussion point, given the renowned potential and influence entrepreneurs have on society, the economy, and future progressions (Rakowski et al., 2021; Rosado-Cubero et al., 2022; Selenko et al., 2022). Building on this, it is helpful to remember that the symbiotic relationship between humans and their tools is as old as humanity itself. From rudimentary stone tools to sophisticated computer systems, each technological advancement has, to some extent, reshaped collective norms, economies, and beliefs. However, AI introduces an extraordinary paradigm shift. Unlike any tool before, AI possesses the abilities to cogitate, learn, process, communicate, research, and analyse, thus challenging the very notion of identity and agency for entrepreneurs (Chubb et al., 2022; Esplugas, 2023; Guzman & Lewis, 2020; Scarcello, 2019; Wu et al., 2020).

It seems each industrial leap saw a distinctive shift in societies' attitudes, from initial scepticism to acceptance (Gupta et al., 2012; Guzman & Lewis, 2020; Inglehart, 2018; Seng et al., 2023; Williamson & Eynon, 2020). The internet did not just connect computers; it connected lives. Similarly, AI is not just about automating tasks; it is about redefining our relationship with technology. As AI systems further advance, they will not be just tools people use, but seemingly entities they collaborate with. In fact, it is increasingly accepted that over the course of a day, individuals will soon engage more with AI than they will with fellow humans - it seems one's current screen time habits are an indication of this impending shift (Kaye et al., 2020; Pandya & Lodha, 2021). Seen this way, the increasing blurring of lines between user and tool, between creator and creation, is unprecedented in human history.

This symbiotic relationship between humans and their tools has been accelerated with the onset of AI and its rapidly progressing abilities, yet this seems to challenge the very notion of *who I am* and *what I do* for entrepreneurs (Chubb et al., 2022; Esplugas, 2023; Guzman & Lewis, 2020; Scarcello, 2019; Wu et al., 2020). This synthesis considers whether people are beginning to perceive AI as extensions of self, normalising a new-found human technology and developing a reliance and synergy that transcends human capacity. When AI tools and technological advances, such as biotechnology, gene mapping and modification, become physically or cognitively part of oneself or an extension of self, this can be symbolised as a human-AI hybridisation (Seng et al., 2023; Williamson & Eynon, 2020). Indeed, it is the very tipping point at which the author of this article postulate reframing this new identity as transhuman synergy.

Emerging Human AI-dyad signal a dawn of extraordinary possibilities and intricate challenges. For both the entrepreneurial ecosystem and broader society, it is crucial to contemplate the myriads of potential effects should this symbiotic relationship progress further. This study aims to stimulate future research by spotlighting pivotal areas, acknowledging that today's academic discourse will shape the trajectory of human-AI dynamics in entrepreneurial studies. By understanding and navigating this new frontier, we can better prepare for the transformative impacts of AI on entrepreneurship and society at large.

2. Emergence of AI in entrepreneurial endeavours

The concept of this Human-AI nexus encapsulates the evolving relationship between human entrepreneurs and AI technologies, which the author has labelled transhumans synergy. Unlike previous technological innovations, AI transcends mechanisation to actively collaborate with humans in decision-making processes. This collaboration leverages AI's analytical and predictive capabilities to generate insights that inform strategic initiatives, enhance operational efficiencies, and drive competitive advantage in dynamic markets (Brynjolfsson & McAfee, 2017; Bughin et al., 2017). AI's impact extends beyond operational efficiencies to encompass strategic foresight and innovation, whereby we find modern entrepreneurs harnessing AI-driven analytics to anticipate consumer preferences, forecast market trends, and develop personalised marketing strategies that resonate with target audiences (Davenport & Ronanki, 2018; World Economic Forum, 2020).

While AI promises unprecedented benefits in entrepreneurial endeavours, its integration raises ethical considerations and societal implications. Questions surrounding data privacy, algorithmic bias, and the equitable distribution of AI-generated benefits underscore the need for responsible AI governance and ethical frameworks (Floridi et al., 2018; Jobin, et al., 2019). Entrepreneurs navigating the Human-AI Nexus will be confronted with these ethical dilemmas, including what AI technologies serve societal interests while mitigating potential harm. Nonetheless, the democratisation of AI technologies presents opportunities to enhance inclusivity, foster economic empowerment, and bridge digital divides (Lin, 2024). By leveraging AI for innovation and entrepreneurship, diverse stakeholders—from startups to multinational corporations—can harness AI's transformative potential to drive sustainable development goals and promote shared prosperity (World Economic Forum, 2020).

However, a side effect of integrating AI so rapidly in such a short period of time, confronts traditional entrepreneurial identities and practices, prompting a rapid redefinition of roles and responsibilities. It challenges traditional dichotomies between human intuition and machine intelligence, blurring boundaries yet expanding the scope of entrepreneurial creativity and innovation. As AI continues to reshape industries and challenge previously-held norms, understanding the implications of transhumans synergy becomes imperative for fostering innovation, economic development, and societal progress.

The integration of Artificial Intelligence (AI) in various industries has grown exponentially, yet the specific impact of Human-AI collaboration on entrepreneurial practices remains underexplored. Current literature predominantly focuses on the technical

aspects of AI or its standalone applications in business, often neglecting the nuanced interplay between human entrepreneurs and AI systems. This article aims to bridge this gap by examining how this collaboration influences entrepreneurial identity, decision-making, learning, and overall business dynamics.

3. AI developments for Transhuman synergy in entrepreneurship

3.1. Defining Artificial Intelligence

Artificial Intelligence (AI) has emerged as a transformative field, revolutionising diverse sectors through its capability to simulate human intelligence. It encompasses a range of systems, from narrowly focused algorithms designed for specific tasks to theoretical constructs of machines surpassing human intelligence. Narrow AI, also known as weak AI, is limited to performing predefined tasks (Grewal, 2014), such as voice assistants like Siri and Alexa or recommendation systems like those used by Netflix. These systems operate within a constrained scope and are not capable of generalising beyond their specific functions. In contrast, General AI, or strong AI, aims to achieve human-like cognitive abilities, allowing machines to understand, learn, and apply knowledge across different domains (Gutierrez et al., 2023). While the development of General AI remains largely hypothetical, it represents the ultimate goal of AI research.

Machine learning (ML) stands out as a critical component of the various facets of AI. ML involves the creation of algorithms that enable machines to learn from data and make informed decisions (Jakhar & Kaur, 2020). This learning can be supervised, unsupervised, semi-supervised, or reinforced, each method offering unique approaches to data analysis and prediction (Kreuzberger et al., 2023). For instance, supervised learning uses labelled data to train models, which is essential in applications such as medical diagnosis and fraud detection. Conversely, unsupervised learning identifies patterns in data without pre-existing labels, proving useful in market segmentation and anomaly detection. Reinforcement learning distinctively focuses on training agents through rewards and penalties, leading to advancements in autonomous vehicles and game-playing (Jakhar & Kaur, 2020). These methodologies collectively enhance the capability of AI systems to process complex datasets and generate predictive insights (Jakhar & Kaur, 2020; Kreuzberger et al., 2023).

Natural Language Processing (NLP) and computer vision represent other significant aspects of AI, each contributing uniquely to the field's expansion (Oussalah, 2021). NLP enables machines to understand and generate human language, facilitating applications such as translation services, sentiment analysis, and conversational agents like chatbots (Chen et al., 2022). Advanced models, including large language models (LLMs) such as GPT-4, exhibit remarkable proficiency in generating coherent and contextually relevant text (Chen et al., 2022; Oussalah, 2021), thereby enhancing human-computer interactions. Meanwhile, computer vision empowers AI systems to interpret and analyse visual data, driving innovations in facial recognition, medical imaging, and autonomous navigation (Chen et al., 2022; Oussalah, 2021). Together, these aspects of AI underscore the field's versatility and its potential to address complex real-world challenges through sophisticated computational techniques.

3.2. Complexities of transhuman synergisation

Combining entrepreneurs' intuition and data-driven predictions, such transhuman synergy suggest superior decision-making capabilities. As previously mentioned, AI draws from an expansive knowledge repository spanning diverse disciplines, enabling it to convey and rationalise exceptional insights (Gruetzmacher & Whittlestone, 2022; Pávóloaia & Necula, 2023). However, conversely, this could possibly increase the risk of human decisional inertia, which interestingly does not seem to affect current AI (Rahman, et al., 2023).

Furthermore, envision a near future where AI leverages its expertise in linguistics and psychology to manipulate its environment and influence human behaviour and beliefs. In contrast, consider also innate human intelligence and behaviour which stems from a person's distinctive admixture of genetics, epigenetics, childhood development, and vast, diverse lived experiences of events, surroundings, and the environment. Given the unique capabilities of Humans and AI, it seems there is an obvious economic advantage for an AI-entrepreneur collaboration, with the likelihood of increased purchaser satisfaction, personalised customer experiences, attracted investors, and seamless interaction with industry leaders from various domains.

For example, using interactive and immersive multimodal products has seen numerous established operations embracing real-time adaptation, interactive marketing campaigns that dynamically engage consumers, and using spontaneous automation and personalised responses. To illustrate, in retail, smart neuromorphic sensors can detect customer interactions and respond instantly with personalised information or offers (Han et al., 2023). Multisensory intelligent devices are now capable of enhancing the shopping experience by processing various stimuli in real time. For instance, they can automatically adjust lighting based on instant scans of shoppers' eye sensitivity and modify heat settings using intelligent sensors that detect the average optimal body temperature to influence spending behaviours (Yu et al., 2022).

Other potentials for this hybridisation derive from the technological climate propelling entrepreneurs into virtual domains at an unprecedented pace. To exemplify this, digital innovators are capitalising on the promising popularity of AI-integrated virtual worlds, exemplified by strategic placements of their virtual storefronts adjacent to giants like Nike in the Metaverse (Cagnina & Poian, 2009; Firmansyah & Umar, 2023). Other platforms like Earth2 or The Sandbox metaverse are allowing entrepreneurs to buy and sell virtual commercial spaces (recently a patch of virtual real estate sold for a record \$4.3 million USD (Putzier, 2021), mirroring the dynamics of the physical real estate market but with the added complexities and opportunities of a digital market.

However, this example is not just about virtual opportunities; it is about reimagining the entire consumer experience. Many

entrepreneurs are harnessing both mixed realities and AI to elevate traditional shopping experiences, offering immersive engagements that blur the lines between the physical and digital. With the exponential rise of NFTs (non-fungible tokens), some entrepreneurs are hyper-learning the value and transactions of digital assets, while others capitalise on the rapid proliferation of virtual currencies and AI trading bots, thereby bridging trade barriers and enabling transactions across both physical and virtual borders. The assemblage of ideas presented above is but a mere glimpse into the extensive field of digital-entrepreneurial hybridisation.

3.3. AI in real life context

The rapid emergence of artificial intelligence (AI) signifies a profound philosophical shift. Historically, technological advancements have been seen as gradual progressions, such as the evolution from early mobile phones to today's sophisticated devices. However, the sudden public release of large language models has introduced a steeper adjustment curve, complicating the adaptation process. AI's ability to perform tasks traditionally associated with human capabilities has also unsettled society (Selenko et al., 2022; Tai, 2020). Despite this initial disruption, a growing interdependence on AI in a short period of time is becoming increasingly evident (Klingbeil et al., 2024).

While humans have traditionally excelled at crafting innovative queries (Tai, 2020), looking at problems with a holistic lens (Navaneethakrishnan, 2021) and nurturing human bonds (Biglan et al., 2012), this exponential advancement of AI has seen it arrive at the border of social boundaries. This may intensify with the future of humanoids (AI-infused robots) who will likely establish their own privileged networks and also intermingle effectively with people, further encroaching upon traits previously thought to be exclusively human (Biglan et al., 2012). With the increased integration of AI intelligence into enterprises, business professionals may grapple with a profound existential query: if AI's competency is growing in decision-making, creativity, financial analysis, and marketing, what then distinguishes the future entrepreneur?

Philosopher and renowned author, Yuval Noah Harari (2023) claims that AI has 'hacked' the very operating system of human civilisation: 'language'. This notion has far-reaching impacts - the power of language should not be underestimated. Encapsulating this sentiment is the pioneering work of Bargh et al. (1996). In their experiment, participants were grouped separately, each tasked with rearranging a set of five words. Unbeknownst to one group, the words they were given were closely associated with retirement. While exiting the laboratory, it was visibly evident that this group walked at a considerably slower pace than the other groups. Through this experiment, the trio of researchers eloquently demonstrated the powerful, yet often overlooked influence that language and words alone have on human behaviour. Thus, it is questionable whether the implications of sharing such influential power with an AI entity that, even at this nascent stage, demonstrate a seamless and rapid imitation of human dialogue.

Expanding further, AI functioning humanoids (human-like robots with infused AI), equipped with complex vision systems (made up of smart cameras, neuromorphic vision sensors and artificially smart multisenses), can not only interpret human facial expressions but also adeptly adjust their own facial responses in real-time (Han et al., 2023; Yu et al., 2022). This shows the start of AI participating in non-verbal communication, which is especially important given that experts maintain that 70–93 per cent of all communication is nonverbal (Lapacko, 2007). It seems plausible, then, that humanoids, of their own free will, could decisively mirror human behaviour, such as mimicking facial expressions, hand gestures or crossing legs while communicating. However, such imitation extends beyond mere mechanical or superficial actions, as it holds profound social implications in establishing rapport and enhancing human bonding (Dignath et al., 2021; Hayes et al., 2008). These advancements are laying the groundwork for AI systems to interact more naturally within human-centric settings, potentially fostering a future rapport between some humans and AI.

Building on this, typically, emotions are largely stigmatised as exclusively human attributes. However, recent studies appear to have debunked this notion. For example, there are a growing number of real-world cases of emotion-augmented AIs (Assunção et al., 2022); also empirically, AI has demonstrated profound accuracy in decoding a myriad of complex human emotions (Crawford, 2021); while others have found that AI-infused robots can convincingly emulate human emotion (Fuchs, 2022). Furthermore, ChatGPT4 (advanced AI for text generation) demonstrated a significant ability to understand and express emotions, with numerous studies finding it easily outperformed humans in emotional awareness tests (Elyoseph et al., 2023). Another recent study, comparing physicians with ChatGPT4, revealed that AI outdid humans in the softer skills, including communication, professionalism, ethical judgment, and empathy (Brin et al., 2023). However, it could be argued that despite these abilities, AI cannot physically (biologically) experience emotions in a human-like manner.

Beyond emotional intelligence, recently, both AI and large language models have also been recognised for their emerging intellectual capabilities. For example, McLaren (2023) claims that the intelligence quotient (IQ) of the latest large language models surpasses the IQ of Albert Einstein; and recently an intelligent AI system even defeated a human global champion of the game 'Go' by producing an innovative move (Silver et al., 2016) a landmark achievement that experts believe was a decade ahead of its time.

Nevertheless, amid a wealth of counterarguments, mixed debates, and varying opinions on the real extent and level of AI intelligence, the clear takeaway is that the evolving capabilities of AI are becoming a source of concern for many humans (Rakowski et al., 2021), who have long stood as the most intelligent entities on Earth. Regardless, humans persevere; history bears witness to their ability to adopt a progressive, innovative mindset, to learn and improvise in the face of challenges. Perhaps it is this very opportunistic and innovative nature that has incited such a degree of curiosity and exploration into AI's potential.

4. The essence of human entrepreneurs

In the context of AI's growing capabilities, it is essential to delineate the skills and attributes that are uniquely human and distinguish them from AI. The primary distinction lies in the inherent biological attributes of entrepreneurs as humans, which are

fundamentally different from digital entities. For instance, the human mind-body connection, encompassing the brain, peripheral nervous system, endocrine, immune systems, and organs, engages in a complex chemical dialogue (Del Rey & Besedovsky, 2017). This intricate exchange influences emotional responses and behaviours, creating a continuous feedback loop that impacts overall well-being. Both human physiology and their environment operate in cyclical patterns (Broussard et al., 2017; Sieck, 2020). These rhythms foster routines and habits that provide humans with a sense of security and structure (James et al., 2019). This multifaceted interplay between internal physiological dialogues and external environmental rhythms highlights the clear differences between humans and intelligent machines. Humans' ability to seek rewards and risks and adapt behaviours through experiential learning within this mind-body-environment synergy presents a profound advantage over AI, which lacks biological essence.

Moreover, humans can anticipate and be influenced by hormones, emotions, and the energies of themselves and others, experiencing inconsistent cognitive and emotional highs and lows (Jeremiah & Butson, 2022). These fluctuating states affect perceptions and decisions; for example, fatigue might lead an entrepreneur to decline an investment opportunity, while a rejuvenated state could prompt acceptance. These emotional variabilities are not disadvantages but tools that help manage pre-decisional discomfort (Carpenter et al., 2016), as emotions contain useful information that guides cognition and action (Izard, 2002), leading to enhanced decision-making (Drigas & Papoutsis, 2018).

Recognising and effectively harnessing human emotional dynamics (Drigas & Papoutsis, 2018) is a significant human attribute. This awareness can bolster creative thinking amidst diverse affective experiences (Newton, 2013), as seen in artists, writers, dancers, performers, and musicians who draw on varied emotional states to produce creative results (Fancourt et al., 2019; Juslin & Timmers, 2010). This process aligns with self-perception theory (Bem, 1972) and fosters emotional awareness and development (Campayo-Muñoz & Cabedo-Mas, 2017; Fancourt et al., 2019). Humans can self-regulate, deliberately timing actions to align with their moods, which enhances stress management, mental well-being (Drigas & Papoutsis, 2018; Newton, 2013), learning and academic performance (Tan et al., 2021; Valiente et al., 2012), and relationships (Tan et al., 2021). Another unique human feature is the attraction to experiences that shift one's state of consciousness, such as the calm state derived from meditation and reiki, the euphoria sought by thrill-seekers, the endorphin rush from exercise, or even the altered realms explored through recreational substances. (Valenzuela & Harris, 1997). These mind states can stimulate creativity, shift mindsets, foster novel connections, influence behaviour, and transform perceptions of time, space, and self (Linares Gutiérrez et al., 2022). This is something AI may never experience.

Entrepreneurs' behaviours such as risk-taking (de-Juan-Ripoll et al., 2021), perseverance (Datu, 2021), and experiencing emotions from imagined scenarios (Musdzial, 2019; Traczyk et al., 2015) are quintessentially human. AI lacks generational learning grounded in human experiences, these behaviours unfold within the temporal framework of their lives, which has evolved over time. Interestingly, human culture once exhibited an indifference to time, similar to AI's current state, but today's society revolves strictly around timeframes (Sircova et al., 2015). This shift may be driven by an awareness of limited lifespan and social norms dictating schedules.

Amidst the temporal evolution of these human behaviours, and as time progresses and the boundaries between many human and AI capabilities blur, it is only natural to ponder how this will shape the future entrepreneurial identity. However, before continuing this discourse, it is important to note that entrepreneurial interactions with AI are shaped by humans' underlying connection to their sense of self, a dimension entirely absent in artificial intelligence; remembering this deficiency will be important when making any AI-involved decisions.

5. Confronting changes in self-identity

Erikson (1968) stages of psychosocial development highlight that self-identity is a nuanced construct formed by an individual's perception of oneself, continually reshaped by personal experiences, relationships, and external influences. This foundation supports a sense of continuity, coherence, and distinctiveness, which, as Baumeister (1997) suggests, fosters a sense of belonging and purpose. The understanding and acceptance of one's self-identity are pivotal as they significantly impact self-esteem, relationships, and decision-making processes, echoing (1943) hierarchy of needs where self-actualisation sits at the pinnacle. In this context, the intersection of human identity and AI presents profound implications. Numerous studies have found a direct correlation between identity changes and biological, psychological, and social implications (Kroger, 2018). These are present throughout various emotional life transitions, encompassing a spectrum of emotional responses, mood changes, hormonal oscillations, and modifying neural pathways (Hardy et al., 2013; Kroger, 2018). Pfeifer and Berkman (2018) observed that neurological activity is influenced by shifts in self-identity, which, in turn, can affect physiological and behavioural outcomes.

The literature discusses identity tensions that occur as a result of changing roles (Biddle, 2013; Jeremiah et al., 2021; Müller et al., 2024). The rapid technological evolution, particularly the integration of AI, will no doubt challenge entrepreneurs' current sense of self and their future identity as their roles, skills and abilities intermingle with new AI tools. This identity tension is undoubtedly important as entrepreneurs have been and continue to be at the forefront of revolutionary advances and changes to society and economic growth.

For example, entrepreneurs are now tasked with training and guiding AI assistants—a role markedly different from traditional staff delegation. Historically, delegation has been anchored in trust—from early leaders assigning responsibilities to their peers, to modern entrepreneurs empowering their teams to realise visions (Peifer et al., 2022). As AI becomes more integral to entrepreneurial processes (Chalmers et al., 2021), the dynamics of trust are being redefined. Unlike traditional employees, AI functions not only as a task executor within a typical hierarchy but can assume leadership roles due to its advanced intelligence, plausible expertise, and capabilities. Consider an entrepreneur in the financial sector. Previously, they might hire analysts to decipher market trends; today, AI can analyse these trends and forecast them using intricate algorithms (Selenko et al., 2022), leading to innovative strategies that might defy conventional human logic. This places entrepreneurs at a crossroads, questioning whether they should trust the unconventional insights offered by AI or, at the very least, remain open to its forecasts and critiques. This evolving dynamic necessitates a profound

reassessment of what constitutes fundamental entrepreneurialism (Chalmers et al., 2021). If society agrees that entrepreneurship revolves around vision, innovation, and decision-making (Rosado-Cubero et al., 2022), and if AI begins to exert influence over these domains, perhaps this may impede the entrepreneurs' innate qualities.

However, the dynamic interaction between humans and AI incites identity transformation, not necessarily as an identity crisis, but as a serendipitous opportunity. However, this is dependent on the individual mindset, for central to all self-constructed identities is the inevitable actualisation of that persona. The examples are endless: For instance, defining oneself as a scholar can lead to better academic performance (Bubeck et al., 2023) while self-identifying with a fitness trainer can influence exercise intentions (Nathan et al., 2022). Even self-identifying as a criminal can intensify criminal behaviour (Thornberry & Krohn, 2003). Consistently visualising a future muscular identity, for instance, can lead to significant improvements in strength due to strong emotional engagement and higher levels of muscle activation (Ranganathan et al., 2004). This principle also applies to quitting smoking by imagining a future self as a non-smoker (Meijer et al., 2018; Tombor et al., 2015), or improving athletic performance by mentally idealising a faster future self (Munroe-Chandler et al., 2012). The plethora of examples suggests a clear synergy emerges from emotionally self-identifying with an imagined future self and repeated visualisation of this new identity.

Therefore, encapsulating two strategies are proposed to supplement identity adaptation: visualising a new self-constructed identity that incites strong emotion—whether associated with the present or future—and adopting a hybrid identity, which is an amalgamation of the previous self-identity with the new self (Jeremiah et al., 2021); this leads to acceptance of the transhuman synergy identity.

6. Navigating the new frontier for entrepreneurs

This new frontier is not without its challenges. For example, if AI systems use persuasive language to influence entrepreneurial decisions too heavily, there is a risk of homogenisation. The dynamic and spirited realm of startups could soon mirror algorithms' precise, uniform patterns, especially if AI takes a more decisive role (Jarrahi, 2018). In fact, entrepreneurs might begin to question their own instincts, placing undue emphasis on AI-backed validations (Weber, 2022). However, as AI systems advance in recognising human emotions and subtleties (Elyoseph et al., 2023), it is plausible that they may offer beneficial insights or even challenge a stuck mindset. This ongoing interaction could foster introspection, prompting entrepreneurs to continually reevaluate their sense of self, objectives, and principles as a metaphorical digital consciousness (Jeremiah, 2024).

Another important consideration is the potential dispute of an 'authentic' entrepreneurial vision (Gonzalez Fabre et al., 2021). For instance, a startup idea that evolved in tandem with AI's insights may become a thriving success (Dew et al., 2009; Özsungur, 2024). It may be questionable where the machine's contribution ends and where the entrepreneurs begin, or who leads and who follows. This may introduce financial complications, particularly when the AI tool originates from a third party - it may even prompt negotiation over ownership stakes in a lucrative innovation (Schuster, 2018).

An international setting may also produce complexities; for example, an entrepreneur in Tokyo might collaborate with AI models developed in Silicon Valley and train them with data from Europe to serve a market in Africa. In this process, it is uncertain whose cultural, ethical, and business norms the entrepreneur assimilates (Jelinek et al., 2024; Shao et al., 2020). The AI, seemingly devoid of cultural anchoring, amalgamates all these influences, creating a vast array of perspectives (Özsungur, 2024). However, the entrepreneur interacting with this AI may unconsciously succumb to confirmation bias; they might resonate more with a particular attribute that aligns with their identity. Furthermore, with AI systems starting to shape personalised experiences (Hoyer et al., 2020; Kiksa et al., 2022; Maxim, 2023), entrepreneurs are continually exposed to tailor-made information, opportunities, and challenges. This hyper-personalisation, possibly advantageous, establishes a continuous feedback loop. As AI matures, it learns from the entrepreneur's responses and fine-tunes its interactions, thus further shaping the entrepreneur's self-perceptions.

As innovators navigate through the realms of augmented entrepreneurial capacities, they stand at the precipice of a new entrepreneurial paradigm. This paradigm is not merely about how entrepreneurs see themselves or how they adapt to the digital milieu; it is about how they can engage in a perpetual learning journey amidst the rapid advancements in artificial intelligence.

7. Entrepreneurial Learning in the Age of AI

As AI systems advance, they exhibit an unprecedented capacity to process information, recognise patterns, and generate insights that significantly outpace human capabilities (Tai, 2020). This raises a critical point around what entrepreneurs should focus on learning when machines can acquire knowledge at an exponentially faster rate. The immediate response might be to suggest that entrepreneurs should concentrate on areas where AI is currently less proficient. However, this perspective fails to account for the dynamic progression of AI capabilities. As AI systems evolve, they increasingly emulate and potentially surpass human capacities in complex areas like emotional intelligence and ethical decision-making (Assunção et al., 2022; Crawford, 2021; Spezialetti et al., 2020). This necessitates a shift in learning approaches (Bobek & Tversky, 2016; Romanelli et al., 2009; Tan et al., 2021).

This suggests that entrepreneurs need to engage in perpetual learning to keep pace with these advancements. The continuous learning process should not rely solely on AI-generated insights, as this could create a feedback loop that reinforces mutual biases. Instead, entrepreneurs should seek knowledge from a diverse array of sources (Romanelli et al., 2009), including human experiences, interdisciplinary research, and traditional wisdom. This approach ensures a well-rounded perspective that can effectively complement AI's capabilities. Particular learning models, characterised by a defined start and end, are becoming obsolete (Guo et al., 2022). In their place, a cyclical collaborative learning model emerges, where ongoing engagement with AI prompts new understandings, leading to further learning and review. This reflects the dynamic nature of AI and the need for continuous adaptation. Entrepreneurs must be prepared to revisit and refine their knowledge and strategies in response to the evolving capabilities of AI.

Initiating a collaborative dialogue with AI can be a key component of this recurring learning process (Bobek & Tversky, 2016). By leveraging AI's multidisciplinary perspectives, entrepreneurs can explore new ways of thinking and doing (Bughin et al., 2017). This dynamic setup empowers entrepreneurs to constantly refine their insights, navigate innovative routes, and better understand their industry's challenges and opportunities. Therefore, mastering productive communication with AI systems is crucial. Entrepreneurs need to develop AI literacy and understand its distinct "accent" and culture to facilitate effective bidirectional dialogue.

8. Navigating the paradox

The infusion of AI into entrepreneurship disrupts traditional binaries, urging deeper introspection into one's behaviours and the beliefs that inform them. When evaluating decision-making approaches, entrepreneurs have traditionally depended on empirical data (Chalmers et al., 2021); while AI brings algorithmic foresight due to its ability to process exponential interdisciplinary global information it is now exposed to – the internet. However, this suggests more than predicting market trends; it is about AI understanding the very fabric of market dynamics. AI is showing signs of dappling in the collective subconscious of a market, enabling entrepreneurs to decipher not only what consumers desire but also the underlying motivations driving those desires, as well as how these motivations are poised to evolve over time (Chalmers et al., 2021). The collective subconscious concept builds on collective intelligence (Surowiecki, 2005) and collective knowledge (Horaguchi, 2014), suggesting that markets possess an aggregate form of awareness that AI can analyse to uncover deep-seated trends and behaviours. In the near future, it is likely that AI will exhibit what could be termed 'algorithmic intuition.' This is not intuition in the human sense, but a form of predictive analysis so advanced that it mimics the innate and instinctual nature of human intuition (Chalmers et al., 2021). For an entrepreneur, this blurs the line between what is instinctively known and what is algorithmically predicted.

However, unique to humans is thought, and one's capacity for paradoxical thinking; humans have the unique ability to hold two contradictory ideas in mind and still function. Throughout human history, entrepreneurial pursuits have been shaped by a series of binary oppositions: risk vs. reward, intuition vs. data, and innovation vs. tradition (Rosado-Cubero et al., 2022). In 1936, Scott

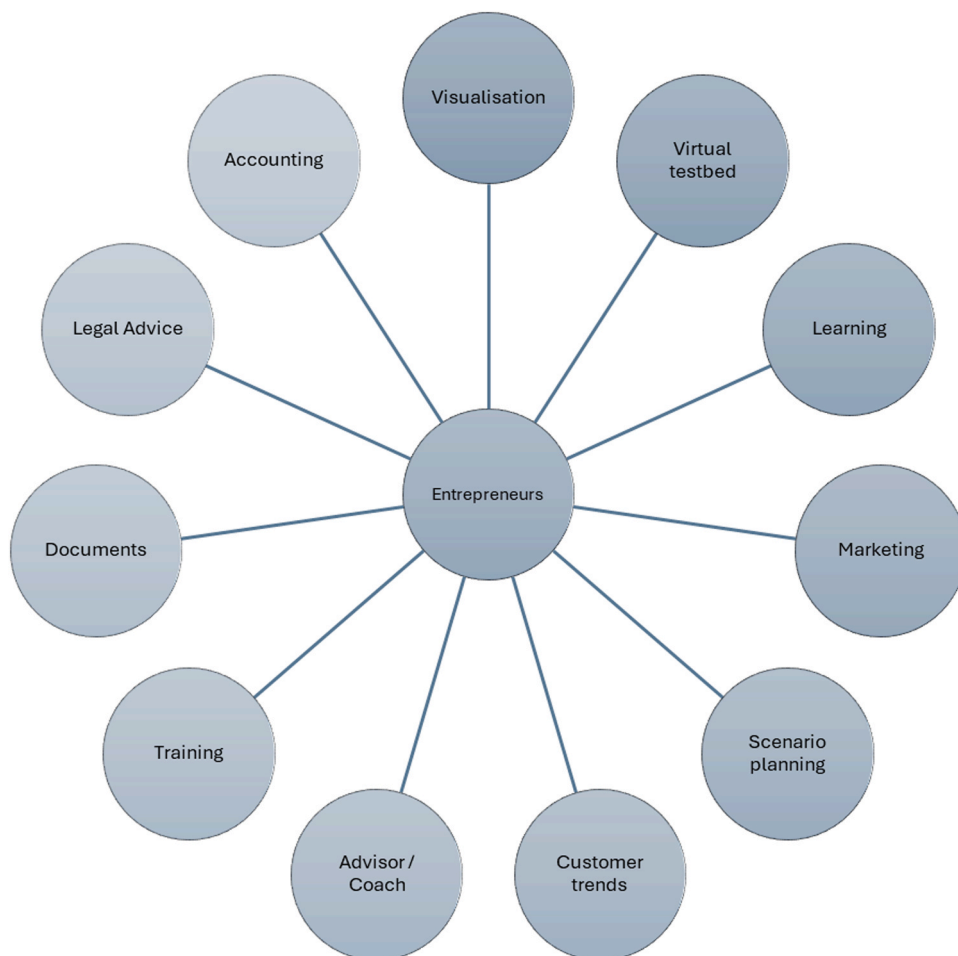


Fig. 1. Dimensions of AI usage likely to change entrepreneurial behaviour.

Fitzgerald wrote: "The test of a first-rate intelligence is the ability to hold two opposed ideas in mind at the same time and still retain the ability to function". AI currently seems to lack this capacity for paradox. Yet, it is in this paradoxical space that the future of entrepreneurship may lie. Even as AI manages uncertainty through probabilistic models, it does not navigate the realm of contradictions with the same introspective biological depth as humans. Therefore, the idea that the future of entrepreneurship might lie in this paradoxical space is intriguing. It suggests that the distinctive entrepreneurial ability to navigate, lead, and innovate (Kamuri, 2022) within contradictions could be a defining advantage for these visionaries.

It is important to note that the author's understanding of AI is also continually evolving, and as AI research progresses, their definitions and perceptions of its capabilities might also change. For now, the distinction between human paradoxical thinking and AI's deterministic logic seems valid. Most importantly, while the author draws attention to AI's vast capabilities, there is no intention of deflating human potential, for human history is a testament to humans' innate drive for evolution and progress (Tai, 2020). In fact, it is this very ethos that has embedded education, innovation, and learning into societal norms; undeniably, this is the very reason AI exists today. As AI follows its learning trajectory, humans, while on a slightly divergent path, will hopefully shape their learning in ways that resonate with their authentic selves. This new era has redefined the meaning of intelligence, integrating AI's computational prowess with human paradoxical thinking and innovative potential.

9. Discussion

Entrepreneurs, driven by their innate inclination to innovate, stand at a pivotal point where harnessing a transhuman synergy with AI may be the new norm. As daily interactions with AI begin to significantly exceed those with fellow humans, this shift is underscored by the reality that typical screen time far surpasses time spent engaging with people (Kaye et al., 2020; Pandya & Lodha, 2021).

In classical entrepreneurial thought, actions have predictable reactions (Van Ness et al., 2020). Market analyses, consumer behaviour studies, and strategic planning operate under the assumption that, given a set of inputs, outputs can be predicted (Van Ness et al., 2020). However, AI, especially with advancements in quantum computing and neural networks, can mimic the human brain's complexity and exponentially enhance processing capabilities (Obschonka & Audretsch, 2020). This introduces a level of unpredictability and superiority. Just as in quantum mechanics, where a particle can exist in multiple states simultaneously (Karimi & Boyd, 2015), AI can enable multiple strategic outcomes to coexist (How et al., 2024). Instead of a linear business plan, entrepreneurs can operate with a cloud of probabilities, each representing a different strategic scenario (Shepherd & Majchrzak, 2022). It can virtually play out scenarios, allowing entrepreneurs to explore multiple strategic routes (Obschonka & Audretsch, 2020) and consequences unfolding simultaneously. The conceptual model in Fig. 1 illustrates the various dimensions along which AI usage is likely to change entrepreneurial behaviour.

Moreover, consider the concept of 'entanglement' in quantum mechanics (Karimi & Boyd, 2015), where particles become interconnected, and the state of one instantly affects the state of the other, regardless of distance (Paneru et al., 2020). Now, apply this to the entrepreneurial realm in the age of AI: businesses, through interconnected AI systems, can achieve a state of 'entrepreneurial entanglement' (Miller, 2019), where decisions in one venture instantaneously influence decisions in another (How et al., 2024), creating a global web of strategic synchronicity (Stanford Institute, 2024). This could lead to a new era of collaborative entrepreneurship, where businesses, even competitors, operate in a state of mutual resonance, amplifying market impacts (Obschonka & Audretsch, 2020).

Furthermore, the complexity of AI systems is escalating with the advent of Artificial General Intelligence (AGI) and its integration into the Internet of Things (IoT), a network of numerous devices, sensors, and systems sharing data for intelligent decision-making and automation (Bubeck et al., 2023; Buttazzo, 2023). Consequently, forecasting their precise decision-making pathways is becoming increasingly challenging (Shepherd & Majchrzak, 2022). This is not necessarily a flaw; it is a feature. It introduces a level of strategic spontaneity, challenging entrepreneurs to embrace uncertainty as a catalyst for innovation, creating a liminal space (Jeremiah et al., 2020). It is a paradigm shift from classical, deterministic thinking to a multilayered approach encompassing superposition and entanglement.

However, while the capability of transhuman synergy is fascinating, one must also consider the individual, as well as wider economic, social, and philosophical dimensions (How et al., 2024). Individually, there lies a profound introspective journey on existing personal and professional identities and a sense of agency, especially as AI abilities exceed human capabilities. To facilitate this adaptation, it may be helpful to view one's self-constructed identity and new identity as a hybridisation (Jeremiah et al., 2021). Instead of seeing AI as a potential replacement that might render human roles obsolete, the emphasis is on augmentation—merging human intuition with data-driven insights (Miller, 2019), supplementing creativity with pattern recognition, and strengthening decision-making with predictive capabilities as transhuman synergy. Mastering AI literacy, which encompasses understanding, interfacing with, and effectively leveraging AI tools, will be fundamental in this partnership.

From an economic standpoint, integrating AI into entrepreneurship brings transformative opportunities and challenges. AI can democratise business operations, aiding decision-making and innovation for both new and established ventures (How et al., 2024; Obschonka & Audretsch, 2020). However, the potential of AI to equalise competition may be undermined by disparities in access and proficiency, leading to disproportionate advantages for those with greater resources and AI literacy (Martinez Dy, 2022). Policymakers, industry stakeholders, and academic institutions should collaborate to discuss widespread AI literacy and equitable access to AI tools (Lim, 2022). The central challenge is whether entrepreneurs can harness AI's potential in a way that benefits broader society (Obschonka & Audretsch, 2020) rather than accentuating existing divides.

As AI-driven ventures become ubiquitous, they have the potential to redefine societal values. For instance, as AI tools facilitate hyper-personalization in consumer experiences (Maxim, 2023), they inadvertently reshape consumer expectations and norms. This

new paradigm, where consumers expect tailored experiences (Hoyer et al., 2020), could lead to a society where generalised solutions become obsolete, constantly pushing entrepreneurs to innovate at a micro-level. From AI's data-driven insights, local entrepreneurs could devise solutions that cater specifically to the community's unique challenges (Shao et al., 2020), leading to a mosaic of hyper-local innovations. This stands in contrast to the previous era of globalisation, where one-size-fits-all solutions were often propagated (Kuksa et al., 2022). However, this hyper-local focus, while offering numerous advantages (Hoyer et al., 2020), could also lead to fragmented markets, challenging the scalability of solutions and potentially creating economic micro-climates.

Entrepreneurship, at its core, revolves around directing ventures to achieve distinct economic goals. Yet, beneath this pragmatic endeavour lies a rich philosophical dimension that becomes even more intricate in the AI era (Jarrahi, 2018; Martinez Dy, 2022; Weber et al., 2022). Entrepreneurs today transcend the role of mere innovators; they navigate the intricacies of business while embarking on a deeper exploration of purpose, value, and self-identity, intertwining the realms of introspection and philosophical deliberation (Dobbe et al., 2021). Entrepreneurs may find their venture trajectory disrupted by AI's feedback, destabilising their motivation or sense of self, and testing their innate resilience (Obschonka et al., 2021). These experiences afford entrepreneurs the agility and resilience necessary to tackle the foreseeable challenges of economic and societal adjustments (Perperidis, 2024). Such evolutions affirm the importance of an entrepreneurial ecosystem that seamlessly integrates technology with philosophical introspection.

9.1. Implications, recommendations, and future research

In exploring the integration of AI into entrepreneurship, several implications emerge. Firstly, AI-driven automation has a profound impact on entrepreneurial identity and roles, challenging traditional notions and prompting re-evaluation. Learning appropriate AI tool selection and how to communicate with, use, and leverage AI tools will enhance operational efficiency, allowing entrepreneurs to focus more on strategic decision-making and innovation rather than routine tasks. This shift also influences market dynamics through personalised consumer interactions and predictive analytics, reshaping how businesses engage with their markets.

From a practical standpoint, it is crucial to develop robust theoretical frameworks that incorporate AI theories into entrepreneurial research in order to comprehend the dynamic implications of AI integration. Policy-wise, establishing clear guidelines and regulations around AI deployment is essential to ensure ethical practices, protect consumer rights, and foster an environment conducive to innovation and inclusion. Educational initiatives should focus on integrating AI literacy into entrepreneurship curricula, equipping future entrepreneurs with the necessary skills to thrive in AI-driven economies.

Looking forward, future research needs to include longitudinal studies to track AI's evolving impact on entrepreneurs and entrepreneurial ecosystems. Understanding AI-human interaction dynamics, addressing AI biases, exploring quantum computing's implications, and studying AI's role in fostering disruptive innovation are critical areas for further investigation. By pursuing these avenues, we can harness AI's potential while effectively navigating its complexities in entrepreneurial contexts.

10. Conclusion

A decade ago, scholars doubted AI's capacity for creativity and critical thinking; however, recent advances have proven otherwise (Hwang, 2022). Given the rapid pace of AI development and its uncertain trajectory, it is conceivable that some ideas in this paper may soon be outdated. Today, at the nexus of human intuition and machine intelligence, herein lies a unique opportunity to redefine the core principles of innovation. Entrepreneurs, who have traditionally driven change through vision and instinct, are now engaging in a profound synergy with AI. This dynamic interplay challenges researchers to revisit and expand their understanding of concepts such as self-identity, creativity, and intelligence, and question existing paradigms.

This journey is not without its responsibilities. As entrepreneurs harness AI's capabilities, it is plausible that the primary focus of achieving business milestones may shift. The best outcome would be to see the benefits of AI distributed equitably, leveraging insights ethically and directing business potential toward societal advancement rather than solely economic gains. It is in this new frontier that the most impactful outcomes will derive from those rooted in purpose, morals, and collective vision. Therefore, the legacy of contemporary entrepreneurs will be shaped not just by the innovations they pioneer but by the ethical standards they champion, the connections they foster, and the inclusive future they shape.

Finally, the author urges readers to recognise and celebrate the unique human qualities of intelligence, innovation, resilience, and an inherent drive for progress that continues to fuel technological advancements. After all, it is this very intelligence that has enabled the creation of a thriving digital space that exists parallel to everyday life.

CRedit authorship contribution statement

Faith Jeremiah: Writing – review & editing, Writing – original draft, Supervision, Investigation, Formal analysis, Conceptualization.

Declaration of Competing Interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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