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Co-produced decentralised surveys as a trustworthy vector to put employees' well-being at the core of companies' performance

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Assessing employees' wellbeing has become central to fostering an environment where employees can thrive and contribute to companies' adaptability and competitiveness in the market. Traditional methods for assessing wellbeing often face significant challenges, with a major issue being the lack of trust and confidence employees may have in these processes. Employees may hesitate to provide honest feedback due to concerns not only about data integrity and confidentiality, but also about power imbalances among stakeholders.In this context, blockchain-based decentralised surveys, leveraging the immutability, transparency, and pseudo-anonymity of blockchain technology, offer significant improvements in aligning responsive actions with employees' feedback securely and transparently. Nevertheless, their implementation raises complex issues regarding the balance between trust and confidence. While blockchain can function as a confidence machine for data processing and management, it does not inherently address the equally important cultural element of trust. To effectively integrate blockchain technology into wellbeing assessments, decentralised wellbeing surveys must be supported by cultural practices that build and sustain trust. Drawing on blockchain technology and relational cultural theory, we explain how trust-building can be achieved through the co-production of decentralised wellbeing surveys, which helps address power imbalances between the implementation team and stakeholders. Our goal is to provide a dual cultural-technological framework along with conceptual clarity on how the technological implementation of confidence can connect with the cultural development of trust, ensuring that blockchain-based decentralised wellbeing surveys are not only secure and reliable but also perceived as trustworthy vector to improve workplace conditions.

KEYWORDS
blockchain, smart contract, co-production, relational cultural theory, employees wellbeing, organisational performance

1 Introduction

The concept of workplace well-being has undergone a significant evolution from its 19th century roots, which primarily addressed the reduction of physical risks, to a modern framework that also considers the psychological aspects of work life (Hammer and Brady, 2021). Agencies such as the U.S. Occupational Safety and Health Administration have expanded their regulatory scope to include psychosocial risks alongside traditional physical hazards (Neilan et al., 2020). Likewise, the International Labour organisation now interprets workplace wellbeing comprehensively, recognizing its connection to the entirety of working life, from the physical working conditions to the emotional states of employees regarding their jobs (Foncubierta-Rodríguez et al., 2024).Historically, organisations treated employee well-being as an optional extra, leaving it largely the responsibility of individual employees. However, the turn of the millennium marked a significant shift, with growing expectations for company leadership to proactively manage and implement well-being initiatives due to the emerging connection between employee well-being and organisational performance (MacVicar et al., 2022). This shift toward organisational accountability has become even more pronounced with the growing expectations of Generation Z, a demographic that places unprecedented value on emotional balance and mental health in the workplace (Hilton Segel and Hatami, 2024). These expectations have been further accelerated by the challenges faced by the global workforce during the COVID-19 pandemic (MacVicar et al., 2022).

The idea that employees' wellbeing is a predictor of job performance has been supported by Wright and coworkers since the early 1990s (Wright et al., 1993; Cropanzano and Wright, 1999). According to Fredrickson and Branigan's *Broaden-and-Build* theory (Fredrickson and Branigan, 2005), positive workplace emotions can enhance cognitive function and social skills, ultimately fostering personal growth and improving social interactions (Barsade, 1993). This positive dynamic can help mitigate the significant financial and human costs associated with mental health issues in the workplace (George, 1992).These studies support the idea that organisations prioritising employee comprehensive wellbeing can achieve lower staff turnover and burnout rates, alongside higher productivity and engagement levels (Fabius et al., 2016; Grossmeier et al., 2016). Consequently, there has been a strategic shift towards viewing employee wellbeing as an essential, rather than optional, aspect of business strategy. Leaders, such as corporate executives and human resources managers, who have a significant impact on business decisions, are increasingly committed to comprehensive wellbeing strategies that are proactive and organisation-wide (MacVicar et al., 2022). For example, recent studies using simulations and historical market performance data show that companies with robust employee wellbeing programs tend to outperform others in the market. A notable example is a group of 45 publicly traded companies with high health and wellness scores (HERO Scorecard), which showed a 235% increase in value, exceeding the S&P 500s 159% increase over the same 6-year period (Grossmeier et al., 2016).

Not only is employee wellbeing important for company performance, but it is also progressively becoming a pivotal factor at a competitive funding level, particularly concerning environmental, social, and governance (ESG) criteria. For companies, ESG criteria are no longer ancillary; they are central to securing investment, fostering consumer trust, and achieving competitive differentiation (Pineau et al., 2022). Within the tapestry of ESG, the 'Social' component is undergoing a significant evolution, with employee wellbeing poised to become a more pronounced criterion, primarily due to its strong link with performance. As comprehensive wellbeing—defined as a holistic approach that considers physical, mental, emotional, social, and financial dimensions—rises to the forefront of global social issues, especially post-pandemic, ESG reporting is beginning to reflect these nuances. Investors are increasingly directing capital toward companies that demonstrate responsible stewardship of environmental resources, uphold social equity, and practice transparent and ethical governance (Pineau et al., 2022).In this context, comprehensive wellbeing plays a crucial role in addressing the underlying issues associated with stigmas, mental wellbeing, and workplace challenges, such as race-based discrimination or gender equity.These issues are not just social in nature; they are also part of organisational accountability challenges, which, if not addressed, can impact a company's perception and performance (MacVicar et al., 2022).

With the social component of ESG rapidly gaining momentum, one of the biggest challenges for businesses has become accurately measuring and reporting it, including metrics and approaches that reflect comprehensive workplace wellbeing, which increasingly requires robust data collection systems supported by digital technologies. This ESG digitalisation involves leveraging digital tools, such as web-based platforms and mobile-based applications, supported by data analytics.This push for digitalisation aligns with the principles of e-participation, a term that originated in the early 2000s and is defined as "the process of engaging citizens through Information and Communication Technologies (ICTs) in policy, decision-making, and service design and delivery in order to make it participatory, inclusive, and deliberative" (UNDESA, 2013). Primarily applied in public policy processes, e-participation mainly focuses on governance issues, aiming to foster openness, participatory engagement, and accountability by enabling stakeholders to actively participate in decision-making processes through the use of digital platforms and technology (Mariani et al., 2025).However, relying on these digital tools for wellbeing assessment poses significant challenges due to the private nature of comprehensive wellbeing and the general reluctance among employees to openly disclose sensitive personal information, particularly those related to mental and emotional aspects of wellbeing, which are often heavily stigmatised.This is compounded by the opacity and the prevalent lack of trust in the systems used to evaluate employee wellbeing, which often fail to provide the transparency, anonymity, and security required to encourage employees to come forward. Concerns about whether their issues will be taken seriously, fear of identity exposure, and potential retaliation can significantly exacerbate fear of being stigmatised and prevent honest communication and feedback (Jean King et al., 2021).These challenges are to some extent similar to those faced by e-participation systems, where trust in online platforms is a major concern. Due to apprehensions about trust, privacy, the security of data, and the veracity of information, individuals may be reluctant to provide personal information or participate in debates online, hindering the effectiveness of digital engagement tools in the process (Kassen, 2021; Shaikh et al., 2023).

To address these limitations, the recent advent of blockchain technology is set to offer a promising shift toward more secure, transparent, and anonymous methods of managing wellbeing assessments (Harvard, 2021; Rahman et al., 2022). This technology, often hailed as a confidence machine, enhances the reliability of, and introduces new dynamics to data management processes (De Filippi et al., 2020). While decentralised wellbeing surveys are slowly trying to establish themselves as legitimate alternatives to centralised digital approaches, they primarily rely on traditional approaches that do not genuinely integrate the cultural component of trust within blockchain technology. In particular, while blockchain can function as a confidence machine for reliable data processing, it does not inherently address the equally important cultural aspect of trust needed by employees to express genuine concerns and needs. This oversight creates both technological and cultural disparities that can undermine the effectiveness of this new approach, as employees may hesitate to engage openly without assurance that they will not be stigmatized or that power imbalances between stakeholders will be effectively addressed.

Here, we discuss the need for decentralised surveys to be supported by cultural practices that build and sustain trust, ensuring effective integration of blockchain technology into wellbeing assessments. Drawing on relational cultural theory, we explain how trust-building can be culturally achieved through the co-production of decentralised wellbeing surveys, which helps address power imbalances between the implementation team and stakeholders.Our goal is to provide a dual cultural-technological framework along with conceptual clarity on how the technological implementation of confidence can connect with the cultural development of trust, ensuring that blockchain-based decentralised wellbeing surveys are not only secure and reliable, but also perceived as trustworthy tools for improving workplace conditions as part of organisational accountability.

2 Wellbeing assessment and the issue of trust and confidence in the digital realm

Traditional approaches to assessing wellbeing have predominantly utilised self-report measures, aiming to capture individuals' subjective evaluations of their own quality of life (Ruggeri et al., 2020). However, the endeavour to quantify such a complex and inherently subjective construct has inevitably led to the proliferation of a wide array of instruments and methodologies, each with its own theoretical underpinnings and focus areas (Linton et al., 2016). This diversity reflects the rich and nuanced nature of wellbeing itself, which encompasses not only hedonic aspects, such as happiness and pleasure, but also eudaimonic dimensions, concerning psychological and existential fulfillment (Ruggeri et al., 2020). Despite the continuous development and refinement of these instruments, no single tool has gained universal acceptance, a testament to the ongoing debate over what constitutes wellbeing and how best to measure it (Ruggeri et al., 2020).

2.1 Wellbeing assessment in the digital realm

The many quantitative and qualitative methods for wellbeing assessment are designed to gauge the multifaceted aspects of employee wellbeing, ranging from job satisfaction and emotional health to physical wellbeing and work-life balance (Linton et al., 2016). These are crucial to understanding the factors that contribute to a productive, engaged, and healthy workforce (Zheng et al., 2015). For example, interviews and focus group discussions offer qualitative insight into employee wellbeing. Through open questions, employees can discuss their experiences, challenges, and suggestions for workplace improvements. On the other hand, regular feedback mechanisms, such as suggestion boxes or employee forums, which can be facilitated through online platforms, allow employees to provide continuous input regarding their wellbeing and workplace conditions.However, the ongoing digitalisation and automation of workplace assessments increasingly prioritise the use of quantitative methods for evaluating employees' wellbeing, which aligns with the growing emphasis on metrics in the digital fabric of modern societies (Kryzhanovskij et al., 2021). Such approaches present opportunities for integration into modern digital frameworks, such as blockchain, which can leverage automated tools like smart contracts, i.e., self-executing pieces of code deployed on the blockchain that enforce predefined rules and conditions. This becomes increasingly relevant as organisational structures evolve in tandem with technological advancements.

The most widely used quantitative tools for wellbeing assessment are standardised surveys and questionnaires, which can be customized to measure various dimensions of wellbeing (Linton et al., 2016).The effectiveness of these tools, developed through extensive theoretical and empirical work, lies in their ability to efficiently and automatically gather extensive data from a broad segment of the workforce, providing valuable insights into job satisfaction, workplace environment, mental health, and overall wellbeing (Mills, 2005). Wellbeing assessment methods based on numerical scale responses (e.g., Likert scales), which are primarily used or can be adapted for the workplace, include among others:

- Job Satisfaction Survey (JSS): measures employee satisfaction across job-related factors such as pay, promotion, and supervision (Spector, 1985).
- Psychological Wellbeing Scale (PWB): focuses on eudaimonic wellbeing, assessing personal growth, autonomy, and life purpose (Ryff, 1989).
- Work-Related Quality of Life scale (WRQoL): Evaluates quality of life related to work, including job satisfaction, stress, and work-life balance (Van Laar et al., 2007).
- Warwick-Edinburgh Mental Wellbeing scale (WEMWBS): Assesses overall mental wellbeing, focusing on positive aspects of mental health (Tennant et al., 2007).
- Worplace PERMA Profiler: Uses the PERMA model to assess positive emotion, engagement, relationships, meaning, and accomplishment in the workplace (Butler and Kern, 2016).
- Occupational Stress index (OSI): Evaluates the level of occupational stress and its impact on employee health (Belki and Savic, 2008).
- Copenhagen Psychosocial Questionnaire (COPSOQ): Measures psychosocial risks in the workplace, including job demands, control, and social support (Kristensen et al., 2005).
- Maslach Burnout Inventory (MBI): Assesses burnout by measuring emotional exhaustion, depersonalisation, and reduced personal accomplishment (Maslach et al., 1997).
- General Health Questionnaire (GHQ): Screens for general psychological health and potential mental health issues in employees (Goldberg and Hillier, 1979).

- SF-36 Health Survey: Measures health-related quality of life across both physical and mental health dimensions (Brook, 1979).
- Job Demands-Resources Model Survey (JD-R): Assesses the balance between job demands and resources to predict wellbeing and burnout (Schaufeli and Taris, 2014).
- Survey of Perceived organisational support: (SPOS): Measures employees' perceptions of how much the organisation values their contributions and wellbeing (Worley et al., 2009).
- Harvard Wellbeing Assessment: A comprehensive tool assessing wellbeing across multiple domains like happiness, health, meaning, and relationships (Weziak-Bialowolska et al., 2021).

The availability of such comprehensive methods enables organisations to assess wellbeing pragmatically, guiding the development of evidence-based interventions aimed at fostering a healthier, more engaged workforce.Notably, the effectiveness of these questionnaires is underscored by the use of rigorous psychometric models rooted in extensive academic research, and by predefined categories such as job satisfaction, psychological wellbeing, and employee engagement, ensuring applicability across diverse organisational and cultural contexts (Ruggeri et al., 2020). However, their design often overlooks the reflective involvement of different stakeholders, as can be achieved, for example, through co-production, *i.e.*, a collaborative process that involves stakeholders in the design and decision-making to ensure that their perspectives and needs are fully integrated (Ostrom, 1996). As a result, they may not adequately account for the unique lived experiences, mental wellbeing challenges, and related stigmas faced by employees, potentially failing to address power imbalances and the specific contextual factors that influence overall wellbeing in the workplace. For example, research highlights that mental health stigmas are worse for members from racial and/or ethnic minorities compared to racial and/or ethnic majorities (Eylem et al., 2020).

2.2 Importance of anonymity and confidentiality in the digital realm

The digital implementation of wellbeing surveys and questionnaires in the workplace often encounters a significant hurdle that can impede the effectiveness and accuracy of these assessments, namely, the concerns surrounding anonymity and confidentiality (Fisher, 2020). While the questionnaires themselves are designed to capture various facets of employee wellbeing, the manner in which they are administered, and the ensuing handling of data are critical in ensuring that the responses obtained are both transparent and representative of the true state of employee's wellbeing (Kaiser, 2009).The majority of the time, companies delegate the task to external private institutes, which specialise in collecting and processing the data garnered from surveys and questionnaires (Iphofen, 2011). External entities are often preferred by employees who may feel more at ease disclosing information to independent bodies rather than internal teams. However, the challenge remains to ensure that the aggregation and handling of sensitive data occur in a manner that upholds confidentiality and anonymity, regardless of whether these processes are managed by private organisations or academic institutions (Fisher, 2020). Therefore, while these external entities often possess the necessary technological tools and knowledge to administer or even design sophisticated surveys, this arrangement introduces unique challenges that can impact the trust in the organisation and the efficacy of the wellbeing assessment process.

When companies outsource wellbeing assessments to private institutes, a primary concern is whether all collected data are accurately processed and considered in the analysis (Iphofen, 2011). The fear that certain responses might be inadvertently or voluntarily omitted or lost during data transfer or processing can lead companies to question the completeness of the insights derived from these assessments. This concern often stems from a lack of direct oversight over the data processing methods employed by external vendors. From the employee perspective, scepticism may arise regarding how their feedback is handled by an external entity and whether their individual voices will truly be heard and acted upon (Kaiser, 2009). The detachment from the internal processes of their organisation can lead to doubts about the impact of their contributions, diminishing their sense of agency and the perceived value of participating in these assessments (Fisher, 2020).

In this perspective, the assurance of anonymity and confidentiality stands as a cornerstone in creating an environment conducive to trust and open communication within organisations. This foundation of trust is essential for encouraging employees to share their honest feedback on wellbeing without the looming fear of potential identification and the repercussions that might follow. Because the surveys are conducted by the company itself, the fear of being singled out for candid feedback can create an atmosphere where employees prefer to withhold their true feelings or to present a facade that aligns with what they perceive as organisationally acceptable (Rahman et al., 2022). In situations where anonymity and confidentiality are not convincingly assured, employees are naturally inclined towards self-censorship. This act of self-preservation not only dilutes the authenticity of the feedback but also undermines the organisation's ability to grasp the true state of employee wellbeing and therefore collect significant data. The accuracy of wellbeing assessments is fundamentally dependent on the genuine and uninhibited participation of employees (Leimanis, 2021).

2.3 Revising the role of trust and confidence in digital wellbeing assessment

In this context, revisiting the fundamentals of psychology through the concepts of trust and confidence can be instrumental in illuminating the gaps present in current methods of assessment and the evaluation of a new technology. The nuanced debate between trust and confidence reveals intricate dimensions of human interaction, especially in contexts characterized by uncertainty and dependence on others for beneficial outcomes. Trust, as elucidated by Gambetta (2020), is a complex interplay between expectations and vulnerabilities, where the trustor makes a conscious decision to rely on another entity under conditions of uncertainty. This decision to trust is not taken lightly; it embodies a calculated assessment of potential actions and outcomes. However, this choice carries inherent risks, making the trustor vulnerable to the possibility of betrayal or disappointment (Smith, 2005). When the trustor opts for trust, they implicitly assume responsibility for this decision, understanding that should their judgment prove misguided, they will bear a portion of the blame for any negative consequences (Smith, 2005).

Unlike confidence, which is derived from predictability and assurance, trust involves a leap of faith, accepting the risk of potential disappointment as an integral component of the relationship dynamic (Luhmann, 2020). The debate between psychologists on trust's essence, whether it is an emotional leap of faith or a rational and goal-oriented choice, underscores its multifaceted nature (Smith, 2005; Giddens, 2007; Simmel, 2011; Taddeo, 2010). Trust can be viewed both as a deep-seated psychological attitude and a pragmatic evaluation of the benefits and risks of relying on another (Taddeo, 2010). The process of evaluating trustworthiness is context dependent. Indeed, in personal relationships, trust is built through direct and repeated interactions, enabling the trustor to form a robust perception of the trustee's reliability and intentions (Dasgupta, 2020; Ellickson, 1994).

Conversely, institutional trust hinges on the perceived legitimacy conferred by formal credentials or societal recognition. In technological contexts, this assessment shifts towards confidence in the system's adherence to predefined rules and reliability (Mitchell, 2005). This transition from personal judgment to systemic predictability reflects a broader societal trend: people often perceive technologically driven institutions as more 'trustworthy' than their human-led counterparts, attributing to technology the capacity to build confidence through its predictability and reliability (Lustig and Nardi, 2015). This perception underscores the role of technology in fostering a sense of assurance and reliability that, in turn, serves as a foundation for trust (De Filippi et al., 2020).Unlike trust, which is borne out of a decision made under uncertainty and carries inherent vulnerability, confidence is derived from the stability and continuity observed in past experiences or the established credibility of third-party experts (Pavlíčková et al., 2013; Luhmann et al., 1979). This foundation of predictability significantly reduces perceived risk, delineating confidence from the vulnerabilities associated with trust (Luhmann et al., 1979). The essence of confidence is further elucidated by Simmel's concept of "weak inductive knowledge," which posits that confidence is rooted in broad experiences or the trustworthiness of experts outside one's direct personal knowledge (Simmel, 2011). Therefore, confidence does not require the individual to make a vulnerable leap of faith or engage in the active decision-making process characteristic of trust (De Filippi et al., 2020). Instead, it represents an assured cognitive state, shaped by a history of reliability and the expectation that future events will unfold in a manner consistent with past occurrences (Seligman, 1998).

This form of assurance, grounded in the objective assessment of systemic reliability rather than subjective judgment, underscores the fundamental difference between confidence and trust. The relationship between trust and confidence is characterized by a dynamic interplay, where confidence can act as a platform for the development of trust. The more confidence there is in a higher-order system, the easier it becomes for individuals to establish trust relationships with entities operating within that system. For example, confidence in the efficacy of a healthcare system can enhance patients' willingness to trust individual healthcare providers (De Filippi et al., 2020). Similarly, confidence in the integrity of a financial system can encourage individuals to engage more readily with financial institutions (Putnam, 2000). This nuanced understanding of trust and confidence, highlighting the responsibility inherent in trust decisions, the impact of technology in shaping perceptions of trustworthiness, and the symbiotic relationship between trust and confidence, enriches the discourse on these critical components of social and systemic interaction.

This exploration of trust and confidence has profound implications for assessing employees' wellbeing in organisational contexts. Wellbeing assessments, inherently reliant on employees' willingness to share honest feedback, necessitate an environment where trust in the confidentiality and ethical use of data is paramount. However, the efficiency and reliability of these assessments hinge on confidence in the systems used for gathering and analysing feedback. The challenge lies in balancing the need for transparent, secure systems that protect employee data (confidence) with fostering an organisational culture that values and acts on employee feedback in a trustworthy manner (trust). In essence, the successful implementation of wellbeing assessments requires a dual approach: enhancing system reliability to bolster confidence while simultaneously cultivating a culture of trust where employees feel safe to express their genuine concerns and needs. The delicate interplay between trust and confidence in this context underscores the complexity of managing human dynamics in organisational settings (Mitchell, 2005), where the ultimate goal is to achieve a harmonious environment that supports both the individual's and the organisation's wellbeing. This complex relationship underscores the necessity of innovative solutions that can bridge these conceptual divides (Lustig and Nardi, 2015).While traditional methods have struggled to ensure the confidentiality, integrity, and reliability of wellbeing assessments, the emergence of blockchain technology offers a promising avenue to address these concerns directly. As we shift from understanding the foundational dynamics of trust and confidence, the following section explores how blockchain technology can serve as a transformative tool in the landscape of wellbeing assessments, while acknowledging its cultural limitations.

3 Blockchain technology and well-being assessment

Blockchain technology is a decentralised, distributed ledger system that operates as a network, transforming how digital transactions are conducted, verified, and securely recorded.From a technological perspective, it seeks to empower anyone with both an internet connection and the necessary permissions to access the network to securely transfer valuable digital assets—including currency, software code, documents, or survey responses—while ensuring robust security and integrity (Casino et al., 2019).The network records data, including transactions and their change history, in a secure and transparent manner. This data is securely organised in a chain of cryptographically linked blocks. Each block contains a unique hash, i.e., a unique identifier generated by a secure mathematical algorithm for the data, and block hashes among contiguous blocks are mathematically linked to ensure the integrity of the information, making it resilient against both unintentional and malicious manipulation while remaining accessible to all participants on the network (Zheng et al., 2017).However, not all blockchains operate at the same level of decentralisation. Public blockchains, like Bitcoin and Ethereum, are designed to be fully decentralised and permissionless, allowing anyone to join the network, participate in consensus, and access transaction data. The governance of these blockchains is typically open and community-driven, with decisions made through mechanisms like community proposals, off-chain discussions, and on-chain voting, which influence the development and evolution of the network. By contrast, private blockchains, such as Hyperledger Fabric, are typically partially decentralised and permissioned, restricting access to preapproved participants and focusing on specific enterprise applications, often prioritising control and governance over full decentralisation. This distinction between public and private blockchains also extends to permission-based and permissionless networks, which define whether participation requires explicit authorisation. The methodical process of adding transactions to the blockchain ensures that all transaction records are permanent and tamper-evident, providing a clear, auditable trail of activity within the network.The principle of decentralisation is fundamental to blockchain technology, particularly in public and permissionless systems.Unlike traditional centralised systems, where a single entity has control over the transaction ledger, a blockchain environment allows the ledger to be maintained concurrently across numerous nodes, eliminating any single point of failure and ensuring that no one entity can unilaterally alter the transaction record (Gatteschi et al., 2018).Potential applications for public and private blockchains have now expanded far beyond the sole cryptocurrency domain initiated by Bitcoin in 2008 (Nakamoto, 2008), encompassing supply chain management (Kim and Laskowski, 2018), protection of digital identity (Zwitter et al., 2020), enhancements in financial services (Treleaven et al., 2017), advancements in clinical research (Charles et al., 2019), protection of intellectual property rights (Wang et al., 2019), securing complaint management systems against harassment (Rahman et al., 2022), tracking employee wellbeing in suppliers' factories (Harvard, 2021), addressing the deterioration of working conditions in academia (Sicard, 2022), and improving e-participation systems (Shaikh et al., 2023; Ietto et al., 2023), among others.

3.1 Blockchain as a confidence machine for wellbeing assessments

The essence of blockchain technology, often celebrated for its potential to function without requiring trusted intermediaries, marks a significant paradigm shift in organisational practices. Andreas Antonopoulos characterizes this shift as moving from relying on interpersonal trust to trusting in the algorithmic integrity of blockchain systems (Antonopoulos, 2014). This concept, further defined by Kevin Werbach as "trustless trust" (Werbach, 2018), suggests that the security and reliability of transactions, by extension, the assessment processes within organisations, are ensured through deterministic computational means rather than through traditional trust dynamics. This argument, primarily negative, focuses on eliminating the need for trust to facilitate interactions that might otherwise be hindered by skepticism or fear of exploitation (Das and Teng, 2004). However, the security of blockchain is not solely the result of algorithmic computation; it can also be seen as a consequence of the behavioural economics equilibrium between all participants, where incentives and penalties help maintain system integrity.

Blockchain instills confidence through several mechanisms, such as its mathematical foundations (e.g., cryptographic hash functions) and consensus algorithms, which eliminate the need for traditional forms of trust. These mechanisms promise high predictability and security, as evidenced by the robustness of blockchain protocols like Bitcoin, which has remained secure against attacks despite rigorous scrutiny. Its decentralised consensus mechanisms are also crucial for validating transactions and maintaining the ledger's integrity without the need for traditional centralised systems. The consensus processes, which might involve protocols such as proof of work or proof of stake, ensure that all network participants agree on the ledger's state, thereby preventing fraud and ensuring that each transaction is accurate and secure. By decentralising this decision-making process, the need to create a privileged group of individuals who make true/false decisions is eliminated, thus preventing any abuse of that privilege.Complementing these technical safeguards, governance mechanisms play a vital role in defining how decisions are made within the network, including updates to protocols, dispute resolution, and determining the roles and responsibilities of participants. These governance frameworks, whether implemented on-chain or off-chain, play a vital role in fostering confidence in the blockchain's operation and adaptability.

These aspects can naturally translate in organisational contexts, where the integrity of employees' wellbeing data is paramount. Since the technology operates independently of any centralised authority, it can be perceived as a less corruptible alternative to traditional mechanism for monitoring and enhancing employees' wellbeing. In fact, employees are often subject to biases, inaccuracies, and a lack of transparency. Blockchain introduces a paradigm where the assessment of employees' wellbeing can be conducted in a manner that is both immutable and transparent, ensuring a fair and accurate representation of employees' conditions (Snow et al., 2014; Benchoufi et al., 2017). In the organisational context, the shift towards blockchain technology for wellbeing assessments signifies a move towards establishing a robust framework of confidence, one where the integrity, transparency, and immutability of blockchain offer a solid foundation for reliably capturing and reflecting the true state of employee wellbeing (Lustig and Nardi, 2015).By enhancing the degree of confidence in the systems used for assessing employees' wellbeing, blockchain indirectly reduces the reliance on trust, thereby streamlining interactions and assessments by mitigating perceived risks (De Filippi et al., 2020).Through checks, balances, and transparency, akin to the principles advocated by Hume (Hume, 1987) and Hardin (Hardin, 2002), blockchain can foster a more secure environment for these assessments. However, this technological pivot supporting a foundation of confidence does not obviate the need for trust entirely (Maurer et al., 2013; Nickel, 2015). But to what extent does truth play a crucial role in the effective conduct of wellbeing assessments?

3.2 Limitations of the confidence machine–The need for trust

While blockchain technology can introduce a significant enhancement in the security, transparency, and integrity of data management within wellbeing assessments, it alone is not sufficient to address all the intricacies involved. The technology is fundamentally seen as a “confidence machine,” adept at creating a secure and immutable ledger where data alterations are transparent and traceable (De Filippi et al., 2020). This capability is undoubtedly valuable in environments where the accuracy and permanence of data are critical. However, wellbeing assessments in organisations demand more than just data integrity, they require a deep understanding of the human elements that blockchain technology can hardly provide.

In health and social care, modernisation policies have emphasized efficiency and convenience, which often parallels the confidence that blockchain brings through its technological capabilities (Sevenhuijsen, 1998). However, effective wellbeing assessments require more than just efficient data processing; they require trust in the intentions and behaviors of those who not only design surveys but also interpret and act upon the data (Maurer et al., 2013).These assessments often deal with sensitive information about employees’ mental and physical health, where the context and subtleties of human experience play crucial roles (Blum, 1991). The challenge in wellbeing assessments, similar to that in healthcare, lies in ensuring that the system’s efficiency does not undermine the quality of human attention that is critical to meaningful interactions and interventions (Smith, 2005). Employees must trust that the administrators of these assessments will handle their data with care and use it to genuinely enhance workplace wellbeing.In organisational contexts, employees may withhold full participation in wellbeing assessments if they do not trust how their data will be used. Without this trust, even the most accurate data can fail to lead to effective solutions, as employees might not see the assessments as genuinely aimed at improving their workplace wellbeing but rather as a tool for surveillance or performance evaluation. Therefore, the collection of their true state of wellbeing will be nearly impossible because if this absence of trust (Winner, 1980).

Moreover, blockchain’s role in enhancing data security does not automatically translate to an increase in trust among employees. Security, transparency and trust are related but distinct concepts; Secure and transparent data can still be used in ways that undermine the interests of the data subjects, both in terms of perpetuating stigmas, neglecting mental wellbeing, and failing to address power imbalances. For instance, data collected securely via blockchain could still be used to implement changes that are perceived as invasive or punitive, if not tempered by trust in the intentions behind these changes (Josang, 2007). Therefore, organisations must not only implement blockchain to leverage its strengths in enhancing the confidence in system capabilities but also actively work to foster interpersonal trust. This involves not only transparent communication about how data is collected, interpreted, and used but, most importantly, how employees are actively engaged in shaping the data collection process.

Overall, it is critical to recognize that the absence of, or imbalance between, trust and confidence is a significant issue in the current landscape of wellbeing assessments. Increasing confidence through technological surrogate like blockchain can certainly bolster the process, but it does not address the full spectrum of needs in these assessments. Trust in the people behind the technology, the administrators interpreting the data and making decisions based on it, for example, is equally important. While blockchain puts confidence into the process, addressing the mechanical aspects of data security and integrity, psychology, the human response to and engagement with these systems, does not stop at the technological process. Wellbeing assessments are as much about understanding and responding to human needs and nuances as they are about collecting data. Thus, without trust, the most sophisticated systems may still fall short of their goal to genuinely improve wellbeing in the workplace. This dual need for both trust and confidence underscore the complex nature of implementing effective wellbeing assessments in modern organisational environments.

4 Co-production as a cultural element for building trust in the digital realm

4.1 Relational cultural theory and the role of co-production in building trust

As discussed previously, trust building remains a critical element that can be easily overlooked in implementation strategies that aim to influence key implementation outcomes such as acceptability, adoption, fidelity, reach, and sustainability (Proctor et al., 2011). This is particularly true when implementation strategies are based on blockchain technologies.To effectively address the issues of trust and confidence, blockchain-based strategies should incorporate two core mechanisms: relational strategies and technical strategies. Although blockchain technology, seen as a ‘confidence machine’, can address the technical side - defined as strategies that aim to build trust by demonstrating knowledge, reliability and competence to support the goals of the team - it does not address the relational side.Relational strategies can be seen as efforts to build trust by addressing power differentials and promoting mental wellbeing and related stigmas among implementation teams and stakeholders, thus strengthening the quality, mutuality, and reciprocity of their interactions. (Metz et al., 2022).

To circumvent this limitation and strategically foster trust within implementation teams and stakeholders, Relational Cultural Theory (RCT) provides a valuable theoretical framework, supporting the idea that understanding others’ perspectives increases a sense of mutual interdependence and leads to positive emotional responses among individuals in relationships (Leeman et al., 2017).RCT primarily focuses on creating and maintaining growth-fostering connections through interpersonal relationships, examining how personal growth and emotional health are shaped by relational dynamics, particularly through empathy-driven exchanges, demonstrations of authenticity, and mutual empowerment. RCT aims to flatten hierarchical structures and challenge power imbalances that affect trust, offering a solid relational framework based on several relational dimensions, including relational authenticity, perceived mutuality, relational connection, and relational empowerment (see Table 1).

TABLE 1 Description of the dimensions of the relational-cultural theory and co-production frameworks relevant to wellbeing assessment and their alignment regarding relational strategies for trust-building.

Relational-cultural theory	Co-production	Alignment
Relational Authenticity: Being genuine and transparent in relationships fosters trust, deepens connection, and enhances collaboration. Authenticity allows individuals to bring their full selves into the relationship, enabling honest communication	Authentic Collaboration: Co-production requires stakeholders to be open about their needs, capacities, and expectations. Transparent and genuine communication helps build trust and ensures that all participants feel heard and respected	Both rely on openness, trust, and transparency for effective collaboration. Authenticity strengthens the relational foundation and promotes meaningful contributions
Perceived Mutuality: Mutuality involves shared responsibility, reciprocal influence, and a sense of interdependence in the relationship. Each person recognizes their impact on the other and works toward a shared outcome	Shared Power and Decision-Making: Co-production fosters mutuality by giving all stakeholders equal responsibility and influence in the design, delivery, and evaluation of solutions. Each participant's perspective is valued, and decisions are made collectively	Both emphasize reciprocal influence and shared responsibility, ensuring that participants work together to shape outcomes. Mutual respect and interdependence are central to this dynamic
Relational Connection: Strong, empathetic connections are essential for fostering growth, emotional wellbeing, and collaboration. Relational connection brings a sense of belonging and solidarity, encouraging deeper engagement in the relationship	Building Trust and Relationships: Co-production thrives on the creation of strong relationships between stakeholders, where trust and a sense of shared purpose are key. These connections encourage long-term engagement and commitment to the process	Both emphasize the importance of building strong, empathetic relationships that foster trust, belonging, and sustained engagement. Connection is essential for collaboration and mutual understanding
Relational Empowerment: Relationships should foster empowerment, where both individuals feel supported and able to express their needs and capabilities. Empowerment is about enabling each person to have agency and voice within the relationship	Empowering Participants: Co-production empowers all participants, particularly marginalized groups, by giving them a significant role in shaping solutions. The process promotes agency and ensures that everyone has an equal voice in decision-making	Both focus on empowering individuals through active participation and shared decision-making, allowing people to express their perspectives and have a tangible impact on outcomes

In this context, co-production aligns with RCT's core assumption that meaningful outcomes are achieved through collaborative, interdependent relationships.While co-production, first coined by Ostrom in the 1970s and defined as "the role of individual choice on decisions influencing the production of public goods and services" (Ostrom, 1996), has gained recognition in fields like public policy and service delivery (Khine et al., 2021; van der Graaf et al., 2021; Goulart and Falanga, 2022) it remains a relatively new concept in the domain of wellbeing psychology. In essence, if executed well, co-production allows for the redressing of power imbalances, providing a foundation for relational ethics and confronting complexities head-on, emphasing key principles, such as inclusivity/diversity, respecting knowledge and reciprocity (Filipe et al., 2017; Tan and Fulford, 2020).Research and practice involving co-production are generally centred around three broad premises (Sims-Schouten et al., 2024). First, the right to be involved in decisions affecting oneself, second the need to improve the value of a project, and third, the requirement to enhance knowledge on a topic (Turakhia and Combs, 2017). Co-production can promote justice and lead to new knowledge, thereby fundamentally democratizing the relationships between the different parties: researchers and research participants (Sims-Schouten, 2025). Central to this is the notion that co-production facilitates equal collaboration between 'experts by experience' and 'experts by qualification', culminating knowledge and freedom of expression, and revealing positions and positionality (Rikala, 2020).Thus, both RCT and co-production emphasize that productive exchanges occur when two or more people jointly create benefits that cannot be achieved alone (Thye et al., 2002).Co-production, like RCT, values mutual engagement and equality, operating on the principle that those with lived experience are uniquely positioned to contribute to designing effective solutions. This partnership-driven approach enhances collective outcomes by building on the same relational dynamics that RCT highlights.

By implementing co-production in the design of wellbeing assessment in organisational contexts, implementation teams and stakeholders can engage in co-learning and co-design processes, enabling them to negotiate and build trust and respect for all perspectives, including those at risk of being excluded from dialogue due to existing stigmas such as race, ethnicity, language, or status, or mental wellbeing challenges, among others.Co-production offers an inclusive relational framework based on the dimensions of authentic collaboration, shared power and decision-making, relationship building, and participant empowerment, which closely align with the RCT dimensions of relational authenticity, perceived mutuality, relational connection, and relational empowerment, respectively (see Table 1). In particular, both frameworks focus on creating growth-fostering, equitable relationships where all participants have an equal role, addressing power imbalances, and building connections that promote trust.

4.2 Co-produced decentralised wellbeing assessment framework (CoDeWe)

Integrating the cultural component of trust with the technological component of confidence is essential for establishing a dual cultural-technological framework to design a co-produced decentralised wellbeing (CoDeWe) survey based on blockchain technology, where employees' wellbeing can be trustfully assessed.As shown in Figure 1, the CoDeWe workflow can be divided into two parts: a cultural component for co-producing the various dimensions and questions of the survey (Capacity Building, Technical Facilitation, Participatory Design, Feedback Loops), and a technological component for data storage (decentralised database management, e.g., IPFS), data security (Blockchain, e.g., Ethereum), and data queries and analysis (centralised database management system, e.g., MySQL). The workflow of CoDeWe consists of the following steps:

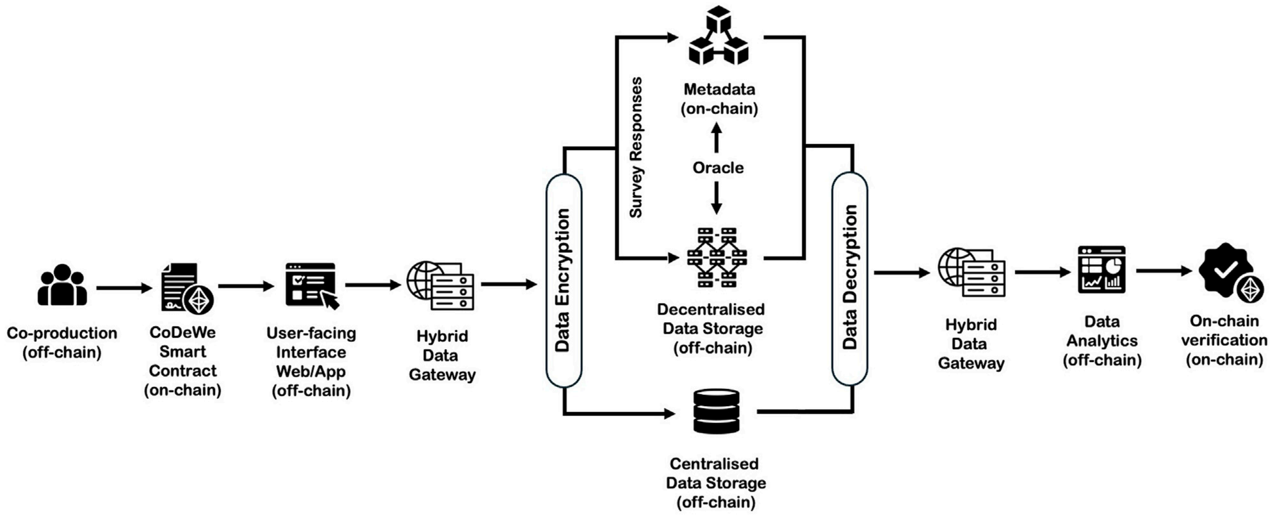

FIGURE 1
Schematic representation of the CoDeWe workflow illustrating the connection between the cultural component (co-production) and technological component (blockchain, smart contracts, decentralised data storage) needed to balance cultural trust with technological confidence.The different dimensions of the surveys are co-produced off-chain using capacity building, technical facilitation, participatory design and feedback loops to identify and address potential stigmas, power imbalance, and mental wellbeing concerns among the different stakeholders (step 1).The finalised questions and survey rules are translated onto the blockchain through a smart contract deployed on a public, programmable blockchain, such as Ethereum (step 2).Respondents access the survey off-chain via a user-facing interface (step 3).After completing the survey, the respondent digitally signs their responses using their unique cryptographic key to verify their authenticity (step 4).The actual survey responses are stored off-chain in a decentralised data storage (step 5).The unique hash identifier generated for the survey responses, along with the respondent's digital signature, are stored on-chain within the smart contract's state, while the timestamp is derived from the block header at the time of the transaction. Additionally, a centralised data storage, such as MySQL, provides efficient querying and analysis of responses off-chain (step 6).The administrator periodically retrieves responses from the off-chain centralised database, analyses the data, and generates reports and visualisations based on the survey results. After analysis, a summary hash of the analysed data is generated and stored within the smart contract, providing a verification point for users (step 7 and step 8).

4.2.1 Step 1 - Survey Co-production

The survey is co-designed with input from participants, ensuring their lived experiences are incorporated into the survey structure and questions. This stage involves a series of collaborative workshops or sessions where stakeholders, including the survey administrator, researchers, and participants, jointly contribute to defining the objectives, survey questions, and parameters. Throughout the co-production process, discussions focus on identifying and addressing potential stigmas that may impact participants' willingness to respond honestly, with strategies developed to frame questions in a way that encourages open, honest participation. Key aspects of co-production include capacity building, which provides participants with the necessary knowledge and tools to meaningfully contribute to survey design; technical facilitation, which offers support to both administrators and participants to understand how digital technologies like blockchain, decentralised data storage, and cryptographic signature help secure and verify their responses; participatory design, allowing participants to shape the questions and structure of the survey to reflect their needs while being sensitive to mental wellbeing and related stigmas; and feedback loops, which continuously gather input from participants and stakeholders during the design phase to refine and improve the survey based on their suggestions and concerns.

4.2.2 Step 2 - Survey Setup

The survey setup is formalised through the deployment of a smart contract on the blockchain, referred to as the CoDeWe Smart Contract. This smart contract serves as a central mechanism that defines the rules and parameters essential for maintaining the integrity of the co-production process. It is designed to manage and store multiple elements directly within its state on the blockchain, ensuring their immutability and verifiability. These elements include cryptographic hashes representing the survey questions, survey responses, agreed-upon parameters, statistical analysis rules and codes, data analysis results, and metadata such as survey and response identifiers. Additionally, digital signatures are stored in the contract's state to enhance accountability and ensure that every interaction with the contract is authenticated.As shown in Figure 2, the smart contract integrates three primary functionalities—query, oracle, and governance—that collectively enable transparency, flexibility, and inclusivity in the survey's lifecycle, in addition to securely storing critical metadata within the smart contract's state.

The query functionality allows survey participants and key stakeholders to retrieve the various states of the smart contract. This includes querying the stored cryptographic hashes of the survey questions and responses, the agreed-upon parameters for the survey, the statistical analysis rules and codes, and the results of the data analysis. These hashes act as references to corresponding elements stored on the decentralised data storage system, such as IPFS, providing a mechanism for transparency and traceability. By enabling easy access to these stored states, the query functionality ensures that survey participants and key stakeholders can verify the survey's structure and content at any time.

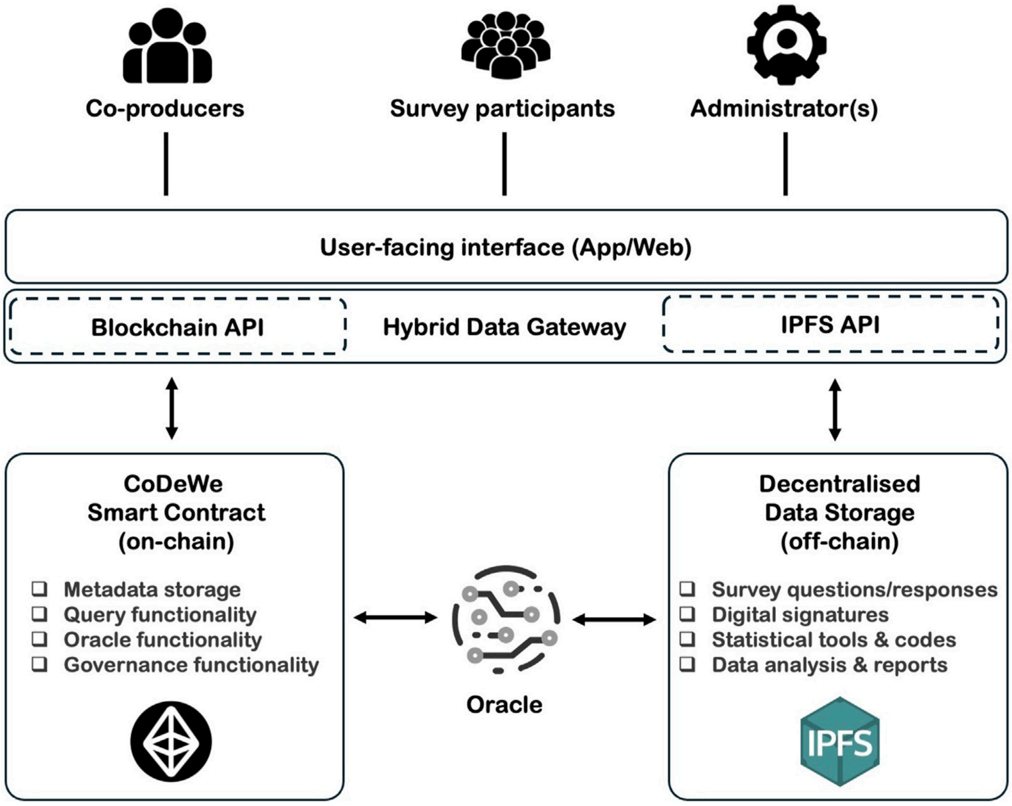

FIGURE 2
Technical architecture of the CoDeWe framework. The schematic illustrates the communication between the CoDeWe smart contract deployed on the public blockchain (e.g., Ethereum), the Oracle, the Decentralised Data Storage (e.g., IPFS), the User-facing interface, and the hybrid data gateway, which comprises the Blockchain API and IPFS API modules. The Blockchain API connects to the Ethereum blockchain via an Ethereum node, while the IPFS API connects to the IPFS network via an IPFS node, facilitating seamless interaction with both the blockchain and the decentralised file storage system.The smart contract integrates three primary functionalities—query, oracle, and governance—in addition to securely storing critical metadata within the smart contract's state.IPFS is used to store survey-related data and digital signatures, ensuring that larger datasets remain immutable and accessible. Each piece of data stored on IPFS is associated with a unique content-addressed hash that serves as a reference for verifying the integrity of the stored data.The Oracle bridges the decentralised storage system and the blockchain by retrieving content from IPFS, generating the corresponding content-addressed hash, and proposing to store this hash within the smart contract's state. The storage action is not automatically executed. Instead, it is contingent on the governance functionality of the smart contract, which enables decentralised decision-making among key stakeholders (co-producers and administrators).Using a voting mechanism governed by the smart contract, key stakeholders evaluate and approve any updates or additions to the stored metadata. This ensures that the oracle's actions align with the principles of co-production (feedback loop, iterative refinement) upheld by the CoDeWe framework. Only after receiving approval through the voting process can the oracle store or update the IPFS content-addressed hash in the smart contract's state.The component corresponding to the centralised database is not represented.

The oracle functionality bridges the smart contract with external systems, particularly the decentralised data storage system (IPFS). Through this functionality, an oracle node retrieves the content-addressed hashes from IPFS that correspond to the survey questions, responses, agreed-upon parameters, and statistical analysis elements. These hashes are then communicated to and stored within the smart contract's state. By managing this connection, the oracle functionality ensures that the blockchain reflects the latest, verified state of the survey and its associated data, maintaining the integrity of off-chain storage.

The governance functionality supports decentralised voting mechanisms, enabling key stakeholders involved in the co-production, management, and analysis of the survey to participate in decisions regarding any changes to the smart contract's state. For example, when updates to statistical analysis rules, survey parameters, or other elements are necessary due to unforeseen challenges or errors, the governance functionality facilitates stakeholder collaboration to approve such changes. Importantly, while stakeholders can participate in the decision-making process, only authorised transactions initiated through the governance functionality can modify the smart contract's state. This design ensures that all modifications are both inclusive and cryptographically verified, preserving the contract's integrity and alignment with the principles of co-production.

All survey-related elements stored in the smart contract are hashed using a standard cryptographic hash function, such as SHA-256, to ensure their immutability, transparency, and ease of verification. These hashes are not stored directly on the blockchain as raw data; rather, they are included as part of the smart contract's state, allowing efficient storage while still benefiting from blockchain-based timestamping. The blockchain's native timestamping provides an immutable record of when each state change occurs, creating a secure and auditable history of the survey setup and any updates over time.The decision to store these elements within the smart contract's state is particularly advantageous in correlational research design, where flexibility is often required to address unexpected data issues, statistical errors, or emerging patterns. The combination of oracle and governance functionalities allows for controlled updates to the smart contract's state, ensuring that any necessary adjustments to statistical analysis rules or survey parameters are implemented in a transparent, cryptographically verified manner.

The design of the CoDeWe Smart Contract closely aligns with the principles of co-production, particularly the feedback loop and iterative refinement. Both survey participants and key stakeholders can query the contract's state to stay informed about all key elements of the survey, such as the hashes of survey questions, responses, agreed-upon parameters, and statistical analysis rules and results. This ensures transparency and accessibility for all involved. However, the governance functionality is reserved for key stakeholders, enabling their active participation in approving any modifications to the smart contract's state. This distinction ensures that while survey participants are kept fully informed, only key stakeholders are involved in the co-production and decision-making processes, thereby maintaining a balance between inclusivity and efficient governance.

4.2.3 Step 3 - Survey Distribution

The survey link or instructions are shared with participants through a user-facing interface, which serves as the platform for accessing the survey. This interface is connected to a Hybrid Data Gateway, comprising the Blockchain API and IPFS API modules. Through this gateway, the survey questions are retrieved from IPFS, ensuring that the questions are stored in a decentralised and secure manner. Participants are made aware of the co-production aspect of the survey and informed that their responses will be securely recorded without capturing personally identifiable information. The questions presented can be verified by comparing them to the content stored in the smart contract, ensuring consistency and authenticity of the survey's content.

4.2.4 Step 4 - Respondent Submission

Participants complete the survey through the user-facing interface. Once the survey is finished, the submission is processed through the hybrid data gateway. Participants have the choice to either use a self-custodial wallet (e.g., MetaMask) or opt for a one-time-use public/private key pair, which can be generated programmatically by the system using a cryptographic library (e.g., WebCrypto API). After selecting their preferred method, the participants digitally sign their responses using their private key. The blockchain API records the signature and generates a cryptographic hash of the response, creating a unique identifier for the submission.The responses are uploaded to IPFS, where they are assigned a unique content-addressed hash. The IPFS content-addressed hash and the cryptographic hash of the response are both sent to the smart contract. An oracle is used to fetch the content stored on IPFS, generate its hash, and compare it with the blockchain-stored hash. To ensure that the data has not been tampered.

4.2.5 Step 5 - Data Storage

The survey questions and responses, agreed-upon parameters, statistical analysis rules and codes, data analysis results, and metadata such as survey and response identifiers are stored off-chain in a decentralised data storage system (e.g., IPFS). To ensure the integrity of off-chain data and its connection to the blockchain, an oracle is used to facilitate communication between the IPFS network and the blockchain. The IPFS network generates a content-addressed hash for these elements, which serves as a unique identifier. The oracle then relays this information, along with the digital signature, to the blockchain network. The CoDeWe smart contract handles this interaction, with the oracle fetching the IPFS hash from the decentralised storage and updating the smart contract's state.Key elements stored in the smart contract's state include the hashes of the survey questions and responses, the parameters governing the survey design and analysis, the rules and algorithms for statistical analysis, the results derived from processing the survey responses, and metadata such as survey ID, response ID, and the digital signatures. This ensures that any changes are verifiable and auditable. The smart contract validates the integrity of the data by comparing the IPFS hashes provided by the oracle with the hashes stored on-chain, ensuring that only valid and untampered responses are considered.

4.2.6 Step 6 - Verification and Integrity Check

The blockchain serves as an immutable ledger of all survey submissions, ensuring that responses remain secure and transparent. The CoDeWe smart contract plays a central role in these interactions by storing the cryptographic hashes and verifying their integrity. It allows anyone to verify whether a specific response was submitted by checking the hash stored on-chain. To ensure the authenticity of the response, the participant's digital signature can be verified against their public key (i.e., a cryptographic key that corresponds to the private key used to sign the response). In cases where there is a need to check whether any responses were excluded from analysis, the administrator can retrieve the list of all response hashes stored in the smart contract's state and compare this list against the hashes of responses that were analyzed (stored in the centralized database, e.g., MySQL) for efficient analysis processing.

4.2.7 Step 7 - Data Analysis

The survey administrator periodically retrieves responses from IPFS for analysis using the hybrid data gateway, ensuring that the responses are securely retrieved and that the integrity of the data is maintained throughout the analysis process. The retrieved data are stored in a MySQL database for fast querying and analytical capabilities. After performing the analysis, the administrator generates a summary hash of the analysed data, which can be cross-verified against the individual response hashes stored on the blockchain. To facilitate controlled updates to the analysis method, any changes to the statistical methodology for correlational analysis (e.g., statistical rules, codes) are stored within the smart contract's state. This ensures that all modifications to the methodology are securely recorded on-chain, with each change adding a new, immutable entry in the smart contract's state. If changes to the methodology are needed, they must be agreed upon by key stakeholders using the governance functionality of the CoDeWe smart contract via decentralised voting. This ensures alignment with key aspects of co-production, such as feedback loops and iterative refinement, fostering continuous improvement and stakeholder engagement throughout the survey process. To minimise costs, the voting process can first be managed off-chain via the user-facing interface, with only the final version of the change validated on-chain, ensuring both efficiency and transparency in decision-making.

4.2.8 Step 8 - Reporting and Feedback

After the statistical analysis is completed, the results and insights are shared with respondents and stakeholders. To ensure the authenticity and integrity of the published findings, the final statistical analysis method, code, responses, and survey settings are stored off-chain in a decentralised data storage system (IPFS), with a cryptographic hash of these elements automatically recorded on-chain within the CoDeWe smart contract. This ensures that any updates or modifications to the methodology or results are securely linked to the blockchain, providing an immutable record of the analysis.These elements, including the final hash, can also be accessed via the user-facing interface, allowing participants to recalculate the hash of the content. By comparing the recalculated hash with the one stored in the smart contract or on IPFS, participants can verify the integrity and authenticity of the analysis. This process ensures that any changes or tampering with the data or method can be easily detected, maintaining the trustworthiness and transparency of the analysis.The CoDeWe smart contract provides a transparent and auditable record of the analysis, making it possible for respondents and stakeholders to verify that the final report is based on untampered data and methods.

From an implementation perspective, the CoDeWe framework can leverage a Layer one public blockchain, such as Ethereum, to ensure transparency, data integrity, and co-creation in the wellbeing survey process. By utilising Ethereum's Proof-of-Stake (PoS) mechanism, the system can achieve a cost-effective and energy-efficient approach to recording critical survey metadata, including timestamps, response hashes, and IPFS content-addressed hashes. While the capacity of blockchain blocks can accommodate the survey responses of large organisations, the system is equally designed to be scalable and inclusive for SMEs. The use of a hybrid data gateway minimises on-chain storage by recording only essential metadata, with supplementary data stored off-chain on IPFS, reducing costs while maintaining robust data integrity. To facilitate secure and reliable communication between IPFS and the blockchain, the system can employ a decentralised oracle network, such as Chainlink, which ensures that off-chain data like IPFS hashes are accurately relayed to the blockchain. For SMEs, additional measures such as Layer two solutions, sidechains like Polygon, or batching multiple responses into single transactions would ensure accessibility and affordability.

Nevertheless, while the system initially considers a public programmable blockchain, such as Ethereum, it is technically extendable to private blockchain frameworks such as Hyperledger Fabric, which can be more attractive for private and corporate environments. This flexibility could allow organisations to tailor the system to specific needs, such as enhanced privacy, compliance with industry regulations, or integration into existing enterprise infrastructure. Given that ultimate consensus on the surveys and their results is controlled by a small number of stakeholder representatives via the governance functionality of the CoDeWe, using a private blockchain framework may be a suitable option. In this context, a private blockchain offers more control over access and decision-making, which aligns with the intended governance structure, where a defined group of stakeholders validates survey results, thereby enhancing privacy and streamlining compliance within the organisation. Additionally, a private blockchain might be more convenient for linking survey results to performance objectives, as it allows for tighter integration with internal systems, ensuring that sensitive data is securely tied to company-specific metrics and goals.However, it is important to note that developing and managing smart contracts requires specialised programming skills in languages such as Solidity for Ethereum. To mitigate this limitation, project libraries such as OpenZeppelin offer well-tested, pre-built smart contract modules that simplify the process, allowing developers to implement complex blockchain functionality at reduced cost.

5 Discussion and conclusion

While the Principles for Responsible Investment (PRI), endorsed by the United Nations and recognized as a leading advocate for responsible investment, identify mental health and healthcare accessibility as two of the four critical social concerns that emerged following the pandemic, the growing trend of integrating wellbeing into ESG reporting is likely to reshape corporate approaches to employee wellbeing assessment. This trend reflects a shift towards acknowledging the multidimensional nature of health, as defined by the World Health organisation, which extends beyond the traditional ESG focus on injury and disease prevention, prompting companies to capture a more holistic view of their employees' experiences.In this context, the increasing investor interest in companies' wellbeing programs and the growing expectations of Generation Z are driving demands for more transparent disclosure of not only the existence but also the inclusiveness of these programs. Companies are therefore incentivized to innovate by adopting digital solutions and data analytics to enhance transparency, efficiency, and effectiveness in managing ESG-related issues, thereby contributing to sustainable and responsible business practices. However, this digital shift also raises critical issues regarding the role of technology in striking a delicate balance between how trust and confidence are culturally and/or technologically achieved.

Building on Relational Cultural Theory and blockchain technology, we explored how decentralised wellbeing surveys can be supported by cultural practices that foster and sustain trust, enabling the effective integration of blockchain technology into wellbeing assessments. We explained how trust-building can be culturally achieved through co-production, which helps to address power imbalances between the implementation team and stakeholders.Specifically, we presented a dual cultural-technological framework and the associated workflow, providing conceptual clarity on how the technological implementation of confidence can align with the cultural development of trust.Trust is a multidimensional category that includes psychological (interpersonal), social (institutions), economic (cost-based), and technological dimensions, among others. In this context, we focus on two critical dimensions: psychological trust, which pertains to the relationships and mutual understanding developed between stakeholders, and technological confidence, derived from the reliability, transparency, and security offered by blockchain systems.At the heart of this framework is the CoDeWe smart contract, which plays a central role in maintaining the integrity of the co-production process. The smart contract acts as a trusted mechanism that links cultural trust with technological confidence, codifying responsibilities, defining survey rules and parameters, and securing survey outcomes on the blockchain.The CoDeWe framework can positively influence Environmental, Social, and Governance (ESG) outcomes, which are increasingly central to securing investment, fostering consumer trust, and achieving competitive differentiation. As ESG criteria are now integral to organisational success, the framework provides a tangible way for organisations to demonstrate accountability and transparency in their wellbeing assessments. By aligning with ESG goals, the CoDeWe framework not only strengthens organisational accountability but also enhances its reputation and strategic positioning in the market, ensuring that stakeholder involvement is not tokenistic, as defined in Arnstein's ladder of participation (Arnstein, 1969), but rather a meaningful contribution to business and social value.The genuine engagement of stakeholders ensures that their participation is not merely symbolic. Instead, it actively influences decision-making, helping to shape the design, implementation, and evaluation of the surveys. This active involvement has the potential to influence governance practices, as organisations are compelled to align their strategies with the insights and needs of their stakeholders. By embedding mechanisms for meaningful feedback and participation, the framework promotes more responsive and inclusive governance, reinforcing both cultural trust and technological confidence while driving positive ESG impacts.One potential evolution of this model could be the development of an intra-organisational Decentralised Autonomous Organisation (DAO), where decision-making processes and power structures are distributed rather than centralised. However, this idealised model of governance relies on the alignment of interests between employees and employers, which may not always be perfectly realised. In practice, employees' interests—focused on wellbeing, fair treatment, and job satisfaction—may not always align with those of employers and investors, who may prioritise profit maximisation and income generation. This misalignment could create challenges in ensuring that governance mechanisms work for all stakeholders, and careful consideration will be required to balance these competing interests.

In the context of workplace wellbeing assessments, blockchain technology presents its own challenges and drawbacks, including regulatory risks related to compliance with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and the free movement of such data, repealing Directive 95/46/EC (General Data Protection Regulation, GDPR), particularly the right to erasure ('right to be forgotten') as outlined in Article 17 of the GDPR Finck (2018). The personal information collected in these assessments comes from questionnaires specifically designed to evaluate employee wellbeing. As the design of these questionnaires is co-produced with stakeholders, the handling of personal data must be integrated into the technical facilitation stage of the co-production process.While GDPR does not apply to anonymized data that cannot be traced back to an individual, cryptographic hash functions—fundamental to blockchain technologies—only achieve pseudonymization and do not fully comply with GDPR when personally identifiable information (PII) from the questionnaires is stored on-chain Finck and Pallas (2020). To protect individual privacy, it is advisable to avoid or limit the use of on-chain storage for PII. Instead, implementing decentralised wellbeing assessment protocols that do not explicitly store PII, along with using temporary digital signatures, would provide a sustainable and GDPR-compliant solution. This approach ensures that the co-produced design of the surveys is aligned with privacy and data protection regulations from the outset.

While the proposed framework and workflow aim to offer a conceptual and comprehensive approach to integrating blockchain technology with co-produced wellbeing assessments, it is crucial to develop, test and validate this system in workplace settings. Some existing wellbeing assessment methods may already integrate with blockchain technology and co-production, and testing will allow us to identify which methods align most effectively with the framework.To ensure the integration of wellbeing metrics with performance objectives, the framework should also incorporate a transparent mechanism that links these indicators to organisational goals, avoiding the risk of treating wellbeing as an isolated goal.Practical implementation will also help assess the system's ability to address key challenges such as privacy protection, trust-building, and data security. Field-testing in diverse workplace environments, once the framework is developed, will provide essential insights, enabling further refinement and optimisation to ensure that decentralised wellbeing assessments are theoretically sound and operationally efficient. These testing results will eventually allow for sample use by respective users in the future, helping them understand how the CoDeWe framework can be applied in practice and contribute meaningfully to improving workplace conditions.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

AD: Investigation, Methodology, Writing–original draft, Writing–review and editing. WS-S: Conceptualization, Writing–review and editing. FS: Conceptualization, Writing–review and editing, Data curation, Investigation, Methodology, Project administration, Supervision, Writing–original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

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