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Developing Assessment Measurement Tool for Work-Life Balance Among Manufacturing Workers Based on Perma+4 Model

(*Membangunkan Penafsiran Bagi Mengukur Keseimbangan Kerja-Kehidupan Berdasarkan Model PERMA+4 Terhadap Pekerja Sektor Pembuatan)*

Mohamad Sukor Abdul Karim
Norhanishah Mohamad Yunus
(School of Distance Education, Universiti Sains Malaysia)
Salfarina Abdul Gapor
(School of Business and Social Sciences, Albukhary International University)
(Section Industrial Logistic, Unikl Mitec)
Bahiah A Malek
(INTI International University)

ABSTRACT

The challenge of maintaining work-life balance in the aftermath of the COVID-19 pandemic has given rise to a new phenomenon commonly referred to as the "New Normal". In alignment with the Sustainable Development Goals (SDGs) outlined in the 2030 Agenda, understanding this New Normal has prompted new efforts to enhance employee wellbeing, particularly with regard to work-life balance. In response, an assessment tool was developed to measure the work-life balance and wellbeing of manufacturing workers, grounded in the PERMA+4 model. The aim of this assessment is to extend beyond the manufacturing sector; it seeks to evaluate wellbeing in the manufacturing sector. It seeks to provide a scalable instrument that may be adapted for use across diverse industries. To ensure the reliability of the assessment, the member check method was employed to validate the questionnaire items. The findings revealed an overall average agreement of 78.2 percent among experts, indicating a strong consensus on the relevance and clarity of the assessment content. This high level of agreement affirms the significance of the questions and supports the relevance of the assessment tool. Furthermore, this assessment is expected to contribute meaningfully to the achievement of the SDG 2030 goals by promoting initiatives that support the wellbeing and work-life balance of workers in the manufacturing sector.

Keywords: *Assessment; SDG; work-life balance; PERMA+4; member check; Likert scale*

ABSTRAK

Cabaran untuk menyeimbangkan urusan kerja dan kehidupan selepas pandemik COVID-19 telah mewujudkan fenomena baharu, "normal baharu". Selaras dengan agenda Matlamat Pembangunan Mampan 2030, pemahaman tentang normal baharu telah mendorong usaha untuk meningkatkan kesejahteraan para pekerja, khususnya dalam hal yang berkaitan dengan keseimbangan antara kerja dan kehidupan. Oleh itu, penaksiran ini dibangunkan untuk mengukur keseimbangan antara kerja dan kehidupan serta kesejahteraan pekerja sektor pembuatan berdasarkan model PERMA+4. Penaksiran ini dibangunkan secara asas supaya ia boleh digunakan melangkaui bidang pekerjaan yang lain. Bagi memastikan kesahan, kaedah semakan ahli digunakan untuk mengesahkan dapatan bagi mencapai tahap kebolehpercayaan item soal selidik yang terdapat dalam penaksiran ini. Dapatan menunjukkan bahawa nilai purata peratusan keseluruhan ialah 78.2 peratus yang menunjukkan bahawa majoriti ahli "sangat bersetuju" dengan semua item yang terdapat dalam penaksiran ini. Nilai purata peratusan ini menunjukkan bahawa keseluruhan soalan yang dibangunkan dalam penaksiran ini mempunyai nilai yang signifikan, sekali gus menjadikan usaha membangunkan penaksiran ini adalah relevan. Selain itu, penaksiran ini adalah selari dengan usaha untuk mencapai Agenda Matlamat Pembangunan Mampan 2030 yang sekali gus memberi impak positif terhadap usaha untuk menjamin kesejahteraan dan keseimbangan antara kerja dan kehidupan para pekerja sektor pembuatan.

Kata kunci: Penafsiran; SDG; keseimbangan kerja-kehidupan; PERMA+4 semakan ahli; skala Likert

INTRODUCTION

The COVID-19 pandemic has been one of the most devastating global crises of this century, claiming over seven million lives worldwide by early 2025. Workers across all sectors have felt the impact, with widespread job losses and economic disruption reported globally (CIPD 2022; Hatayama et al. 2022; ILO 2020; Ma et al. 2023). This upheaval has placed immense pressure on individuals, significantly affecting their mental health and emotional wellbeing (Giorgi et al. 2020; Rodoplu Şahin et al. 2022). Workers in the manufacturing sector have not been spared, as they too have faced similar challenges (Regional Office Hub in Thailand 2020). Although many industries adopted "New Normal" work practices,

such as remote work and flexible arrangements, manufacturing companies often required employees to remain physically present due to the nature of their operations. Unlike service-based sectors, manufacturing relies heavily on in-person processes and production activities. As a result, only administrative roles within these companies were able to benefit from remote work options, while production staff continued to work on-site under pandemic-related constraints (Ardolino et al. 2022; Dar et al. 2021; John Karr et al. 2020; Palaniappana 2024)

The "New Normal" post-COVID-19 has created a significant divergence in workplace experiences between those who can work remotely and those, like manufacturing workers on the production floor, who must be physically present. While much of the literature focuses on remote work and hybrid flexibility, the unique, under-addressed challenges faced by in-person manufacturing employees require more attention. These challenges span health risks, psychosocial stressors, increased monitoring, and a lack of autonomy or flexibility, all of which affect productivity, morale, and retention (Parmar 2025; Ropponen 2025). Manufacturing environments often involve close physical proximity, shared equipment, and limited ventilation, making them high-risk settings for the transmission of infectious diseases. Unlike remote workers, production employees must continue to operate in these environments, leading to heightened concerns over personal and family health (World Manufacturing Report 2024). According to a study by Ropponen (2025), production workers experienced heightened stress, an increased workload due to staff shortages, and reduced access to organisational support structures during and after the pandemic. Unlike office workers, they generally have lower job control and limited flexibility, which are key drivers of work satisfaction and mental well-being.

The rapid pivot to remote and hybrid work models has primarily benefited knowledge workers. In contrast, manufacturing workers lack the flexibility associated with these models, resulting in fewer benefits from new worker-centric policies like "the right to disconnect" or home office ergonomics support. While office staff gained perks like remote work and flexible hours, production workers were excluded. This disparity has led to morale issues and perceptions of unfair treatment within organisations (Bloom 2022). As highlighted by Ropponen (2025), this divide is both technological and socioeconomic. With the increased deployment of IoT, wearables, and smart monitoring systems on factory floors, manufacturing workers are experiencing new forms of digital oversight. These technologies can enhance safety and efficiency but may also increase perceived surveillance, reduce autonomy, and contribute to stress (Ropponen 2025). Additionally, the rise of automation, AI, and digital tools in manufacturing necessitates the development of new skills. Workers must adapt quickly to operate advanced machinery or interface with digital systems, often without adequate training or support (World Manufacturing Report 2024).

The New Normal is a concept or approach that explains the employment situation during the COVID-19 pandemic and its aftermath. Changes in working methods due to the pandemic have created a phenomenon in the work environment and job performance. The pandemic situation has led to the widespread introduction of teleworking and remote work systems, as the government has implemented restrictive policies to control the spread of the virus. However, for the manufacturing sector, production floors cannot implement telework or remote systems because work needs to be done on-site. Due to this situation, assessment development has been introduced with the purpose of measuring the level of wellbeing of workers in the manufacturing sector during the endemic era. Several references have been chosen as a guide to developing the SDG-NN index assessment, mainly referring to previous studies (Boateng et al. 2018; Guerin et al. 2016; Lorenz et al. 2023). Furthermore, there are several assessments developed by authorities related to occupational safety and health that serve as a guide for developing this assessment (CCOHS 2022; DOSH 2024; Health Unit 2022; NSW 2022)

BACKGROUND OF THE STUDY

COVID-19 AND POST COVID-19 WORK-LIFE BALANCE (WLB)

As countries implemented lockdowns and social distancing measures during the COVID-19 pandemic, remote work and virtual communication quickly became the norm, disrupting traditional workplace structures. These shifts sparked widespread discussions about the challenges of maintaining work-life balance while working from home. The pandemic introduced new levels of flexibility but also increased mental strain for many employees. In the current endemic phase, organisations are re-evaluating their work policies, with many adopting hybrid models that combine remote and in-office work to better balance productivity with employee wellbeing. Adjustments to work hours have also played a role in supporting work-life balance, especially as many employees continue to work beyond standard hours. On average, individuals spend approximately 90,000 hours of their lives at work, underscoring the importance of ensuring that the workplace contributes positively to their overall quality of life rather than becoming a source of stress or hardship. This perspective highlights the critical need to balance productivity with wellbeing (Oksana Lavri 2023). Kadir et al. (2021) assert the theoretical development through employability, psychological wellbeing and work life balance influence employee's behaviour to move to other organizations. This provides a theoretical foundation for evaluating work-life balance as a critical factor in understanding employee mobility versus organizational attachment.

Although most countries declared the endemic phase in early 2021 due to declining and controlled case numbers, the COVID-19 situation remains uncertain (Biancolella et al. 2022; Farrag et al. 2023; Zakaria et al. 2023). As of December 2024, the virus continues to circulate, albeit under more manageable conditions. During this period, the Sustainable

Development Goals (SDGs) have also raised important questions about how to address these evolving challenges in a way that supports both individual wellbeing and broader societal resilience.

The COVID-19 pandemic has fundamentally reshaped the global work environment, accelerating the adoption of remote work and virtual communication. These shifts have challenged traditional workplace norms and intensified discussions around work-life balance, particularly in relation to flexibility, mental health, and productivity. As organisations transition into the endemic phase, many are adopting hybrid work models to reconcile operational efficiency with employee wellbeing (Lavri 2023). However, while these models offer promise, they also raise concerns about blurred boundaries between work and personal life, increased working hours, and the psychological toll of constant connectivity. Despite the declaration of the endemic phase in early 2021, the global situation remains precarious (Biancolella et al. 2022; Farrag et al. 2023; Zakaria et al. 2023). The ongoing nature of COVID-19 underscores the need for resilient and adaptive work-health policies. In this context, the Sustainable Development Goals (SDGs) provide a valuable framework for evaluating and guiding recovery efforts, particularly in promoting decent work, health, and wellbeing.

Globally, while both manufacturing and service sector employees encounter challenges in maintaining work-life balance (WLB), the nature and intensity of these challenges vary across industries. Manufacturing workers often face long hours, rigid schedules, and physically demanding tasks that heighten stress and reduce opportunities for flexibility (Bloom et al. 2006; Lestari et al. 2023; Ganiyu et al. 2020). In contrast, employees in the service sector, though generally benefitting from greater temporal flexibility, frequently experience emotional exhaustion, customer-related stress, and blurred boundaries between work and personal life due to the prevalence of digital and remote work environments (Yuan & Suryani 2025; Lin et al. 2024). Flexible work arrangements (FWAs) such as flextime, telecommuting, and hybrid models have proven effective in enhancing WLB, job satisfaction, and employee engagement in both sectors, but their impact tends to be stronger in the service industry, where job tasks are less tied to physical presence (Czerwińska-Lubszczyk & Byrtek 2024). In Malaysia, while the manufacturing sector remains the backbone of economic growth, workers report only moderate WLB and high occupational stress, mainly due to rigid work environments and workplace conflicts (Noordin et al. 2023). Conversely, the service sector, particularly in finance, education, and ICT, shows greater progress in adopting FWAs, which correlate positively with job satisfaction, retention, and productivity (Yusaini et al. 2023; Nair et al. 2023; Samad et al. 2024). Nonetheless, both sectors face ongoing challenges in institutionalizing supportive organisational cultures and policies that holistically address employees' work and family needs, underscoring the importance of strategic WLB initiatives for sustainable workforce wellbeing and performance.

SITUATIONS OF GUIDING QUESTION

The evolving challenges of work-life balance in the post-pandemic era have prompted several guiding questions that align with the Sustainable Development Goals (SDGs). One key consideration is how the SDGs influence the dramatic shifts in work-life balance brought about by the "New Normal" or endemic phase. It is also essential to explore how diverse experiences of wellbeing and work-life balance during this period can inform better responses and practices. Another important question is which work-health policies have proven most effective in supporting work-life balance while helping manufacturing companies recover and realign with the objectives of the SDG agenda. Additionally, ensuring the availability of timely and reliable data is critical for strengthening the resilience of statistical operations and enabling informed decision-making in the recovery process.

The aftermath of the COVID-19 pandemic has shown that the SDG framework is increasingly relevant as part of a broader recovery strategy. The development of the current assessment is expected to contribute positively to improving the quality of life and work-life balance among employees. By measuring these aspects through targeted surveys, employers can gather valuable feedback that serves as a basis for refining workplace policies and regulations. These adjustments can help ensure that organisational practices are aligned with the wellbeing needs of employees, ultimately supporting the achievement of the SDG 2030 agenda.

Work–life balance is intrinsically linked to the United Nations Sustainable Development Goals (SDGs) through its focus on human wellbeing, gender equality, and sustainable human development. By promoting employee wellbeing, reducing work–family conflict, and creating supportive environments that enable individuals to thrive both professionally and personally, WLB advances key sustainability objectives aligned with SDG 3 (Good Health and Wellbeing), SDG 5 (Gender Equality), and SDG 8 (Decent Work and Economic Growth). Beyond coordinating work and family responsibilities, WLB reflects a broader commitment to social sustainability by fostering fairness, personal dignity, and inclusive community development (Garcia et al. 2025; Naeem et al. 2025; Begum 2024; Rao 2017; Tirado 2020; Fazal et al. 2022). Empirical evidence shows that WLB initiatives such as flexible work arrangements and family support policies improve psychological health and reduce stress (SDG 3), enhance women's participation and equity in the workforce (SDG 5), and strengthen employee engagement and productivity, thereby supporting decent work and sustainable economic growth (SDG 8) (Nurhasanah et al. 2024; Saufi et al. 2023; Diamantis et al. 2022).

DEVELOPING OBJECTIVE SDG-NN INDEX

While the SDGs have been widely adopted since 2015 to balance economic, social, and environmental dimensions (UN 2015), their integration into work-life balance research remains limited. Most studies focus on general well-being or specific SDG goals, such as Goal 8 (Decent Work) (Gammarano 2018), without comprehensively addressing the intersection of work-life balance and sustainable development. Moreover, existing wellbeing scales often omit work-life balance as a core component (Pradhan & Hati 2022), suggesting a disconnect between theoretical frameworks and practical realities.

The PERMA+4 model, rooted in positive psychology, offers a promising approach to measuring wellbeing. However, its application in workplace settings, especially in manufacturing sectors, has been underexplored. While some studies have linked PERMA elements to mental health (Wilczyński & Kołoszycz 2023), few have examined their role in work-life enrichment (Baral & Bhargava 2010). This gap highlights the need for more nuanced tools that capture the complexity of employee experiences in post-pandemic contexts. Additionally, literature lacks consensus on effective policy interventions. For instance, while hybrid work is often praised for its flexibility, it may exacerbate inequalities, particularly for women and marginalized groups (Goal 5). Similarly, technological advancements (Goal 7) can enhance productivity but may also lead to job displacement and increased stress.

Work–life balance refers to the extent to which individuals perceive they can effectively align work and non-work demands in accordance with their personal values and life goals. Rather than implying an equal distribution of time, WLB emphasises a subjective sense of harmony and fulfilment across domains such as work, family, community, and personal interests, which may vary with life stage and circumstances (Haar et al. 2019; Hassan et al. 2020; Bakar 2024; Stankevičienė et al. 2021; Liswandi & Muhammad 2023). It is typically conceptualised through dimensions of time, involvement, and satisfaction, in the balance between work and non-work roles. In contrast, wellbeing represents a broader construct encompassing psychological, social, and physical dimensions, reflecting one's overall life satisfaction, resilience, productivity, and capacity to contribute meaningfully to society (Donalson et al. 2022). Within organisational contexts, the PERMA+4 framework, comprising Positive Emotion, Engagement, Relationships, Meaning, Accomplishment, Physical Health, Mindset, Physical Work Environment, and Economic Security, offers a comprehensive model of work-related wellbeing. WLB functions as a key antecedent to several PERMA+4 elements by fostering positive emotions, engagement, and relational quality through stress reduction and the promotion of meaningful role integration. Nevertheless, WLB should be understood not as synonymous with wellbeing but as one critical determinant within the multidimensional construct of holistic wellbeing.

TOWARDS A COMPREHENSIVE ASSESSMENT FRAMEWORK

To address these gaps, the proposed SDG-NN Index combines selected SDG goals with the PERMA+4 model to assess work-life balance and wellbeing among manufacturing workers. This integrative approach aligns with the multidimensional nature of the SDGs and offers a more holistic understanding of employee wellbeing. Table 1 outlines the competencies derived from eleven SDG goals, while Table 2 details the assessment dimensions. The development of a robust measurement scale is crucial for validating this framework. Drawing on established social research methodologies (Earl Babbie 2013; Mark N.K. Saunders et al. 2023; Robert F. Devellis 2017), the scale employs expert reviews and member checks to ensure reliability. The validity thresholds, with high and very high agreement levels, indicate strong construct validity.

1. Developing Assessment measures such as contribution to the achievement of SDG in economic resilience and employee wellbeing
2. Measuring the level of work-life balance and wellbeing among workers in the manufacturing sector post COVID-19 based on the PERMA+4 model
3. To align the elements and role of SDGs in assessing the level of wellbeing of manufacturing sector workers towards improving the quality of life.

Table 1 presents a selection of Sustainable Development Goals (SDGs) that are considered highly relevant for adaptation within this assessment framework. A total of eleven SDG goals were chosen and integrated with the elements of the PERMA+4 model, combining global sustainability priorities with psychological wellbeing indicators. The table outlines the key competencies derived from this integration, which are essential for evaluating work-life balance and wellbeing among manufacturing workers. By merging the SDGs with the PERMA+4 model, the assessment becomes a more comprehensive and effective tool for measuring employee wellbeing. This combined approach allows for a deeper understanding of how workplace conditions align with both individual needs and broader sustainability objectives.

TABLE 1. SDG 10 goal core competencies covered in work-life balance- wellbeing index

Competencies 1 (Goal 3)	Recognising the importance of a safe and healthy workplace environment is essential. Employees should understand that workplace conditions can significantly impact their own lives and the wellbeing of their families.
Competencies 2 (Goal 5)	Introducing a technology-driven approach to promote the empowerment of women in the workplace.

Competencies 3 (Goal 7)	Identifying resources in sustainable energy technology can encourage employee involvement in advanced systems, enhance their skills, and thereby provide a strategic advantage in increasing income and career progression.
Competencies 4 (Goal 8)	Recognising the need to promote sustained work-life balance and improve productivity, it is essential to ensure better financial stability and foster a healthy, wellbeing-oriented work environment in order to mitigate risks associated with human trafficking.
Competencies 5 (Goal 9)	Recognising quality and sustained workplace and equitable access for all workers.
Competencies 6 (Goal 10)	Recognising empowerment and safety issues in socioeconomics and politics, and policy, irrespective of identity and status issues.
Competencies 7 (Goal 11)	Recognising how workers live in a safe environment in cities for a work-life balance with their family.
Competencies 8 (Goal 12)	Understanding workers' lifestyles and their adaptation strategies is essential for managing resources effectively and minimising the impact on their personal lives, health, and the environmental conditions in which they operate.
Competencies 9 (Goal 16)	Recognising workers' rights and preventing issues related to human trafficking and child labour, while ensuring inclusive participation in decision-making processes at all organisational levels.
Competency 10 (Goal 17)	Recognising the importance of striking a balance between work and sustainability can assist organisations in ensuring that employees' work-life balance and wellbeing are safeguarded, while also enhancing motivation and productivity.

WORK-LIFE BALANCE WELLBEING MEASUREMENT

Wellbeing can be measured through various approaches, with subjective wellbeing being one of the most widely recognised methods (Kun et al. 2017). The Sustainable Development Goals (SDGs), introduced in 2015, aim to integrate and balance the three core dimensions of sustainable development: economic, social, and environmental (United Nations (UN) 2015). This global agenda promotes wellbeing and quality of life through a rights-based approach, emphasising socioeconomic and human rights. Over the past decade, numerous assessments have been conducted to evaluate progress towards the SDG targets across different sectors and challenges (Bidarbakhtnia 2020; Gripenberg 2015; Kubiszewski et al. 2022). However, there remains a noticeable gap in research specifically addressing the intersection of work-life balance and the SDGs. Only a limited number of studies have explored this connection (Hwa 2020; Rao 2017), with one notable report focusing on SDG Goal 8, which advocates for decent work (Gammarano 2018).

Work-life balance has also been identified as a predictor of subjective wellbeing (Hoffmann-Burdzińska & Rutkowska 2015), yet very few studies have examined the combined impact of work-life balance and overall wellbeing (Wilczyński & Kołoszycz 2023). Existing wellbeing scales often overlook work-life balance as a key component (Pradhan & Hati 2022). To address this gap, it is essential to incorporate work-life balance elements into the broader dimensions of employee wellbeing, particularly through targeted interventions based on the PERMA model (Wilczyński & Kołoszycz 2023). While this model is effective in identifying mental health aspects, it has limitations due to the lack of research on work-life enrichment (Baral & Bhargava 2010). The PERMA+4 model, developed by Seligman, offers a more comprehensive framework and is well-suited for measuring work-life balance and wellbeing among manufacturing workers.

During the pandemic, many workers experienced heightened stress due to travel restrictions and strained relationships with supervisors, which influenced turnover intentions (Suhaimi et al. 2023). In developing the SDG-NN Index, designing a reliable scale was a critical component. This scale serves as a tool to validate the questions used in the assessment and is conceptually aligned with its objectives. Validation was conducted using the member check method, which involved expert reviews to determine the level of agreement with the questions. The scale design draws upon established methodologies in social research (Babbie 2013; Saunders et al. 2023; Devellis 2017).

To assess validity, the process aligns more closely with content validity than with face validity alone. While face validity refers to the extent to which findings or instruments appear accurate and meaningful on the surface, essentially, whether they "look right" to participants or stakeholders, member checking goes beyond this superficial level. It systematically involves participants in verifying that the data interpretations and conclusions genuinely reflect their experiences, perspectives, and meanings. This process, therefore, assesses content validity by ensuring that the research findings comprehensively capture all relevant aspects of the phenomena under study and represent participants' realities with depth and accuracy (Kornbluh 2015; Vella 2021). Hence, although member checking can contribute to face validity, its primary function is to strengthen content validity and enhance the overall credibility and trustworthiness of qualitative research findings (Birth et al. 2016; Candela 2019; Thomas 2017).

The development of the SDG-NN Percentage Level of Questions Validity is grounded in clearly defined cut-off levels that ensure methodological transparency and alignment with psychometric best practices. In this framework, the validity of each question is assessed using predefined percentage ranges: 81–100% (very high validity) indicates that the items strongly measure the intended construct; 61–80% (high validity) reflects good reliability and relevance; 41–60% (moderate validity) denotes acceptable but improvable accuracy; 21–40% (low validity) suggests that items may require revision or refinement; and 0–20% (very low validity) signifies that the items are unlikely to validly measure the construct. Establishing these thresholds enables consistent interpretation of question quality and supports the credibility of the assessment instrument. This approach aligns with established psychometric standards, which advocate for explicit reporting of validity thresholds to enhance methodological rigor and comparability across studies (Carmines et al. 2006; Earl Babbie 2013; Mark N.K. Saunders et al. 2023; Robert F. Devellis 2017).

In summary, while the pandemic has catalysed important changes in work-life dynamics, the literature remains fragmented and often lacks critical engagement with the SDGs. The proposed SDG-NN Index and PERMA+4 integration offer a novel pathway for assessing and improving employee wellbeing in the manufacturing sector. Future research should

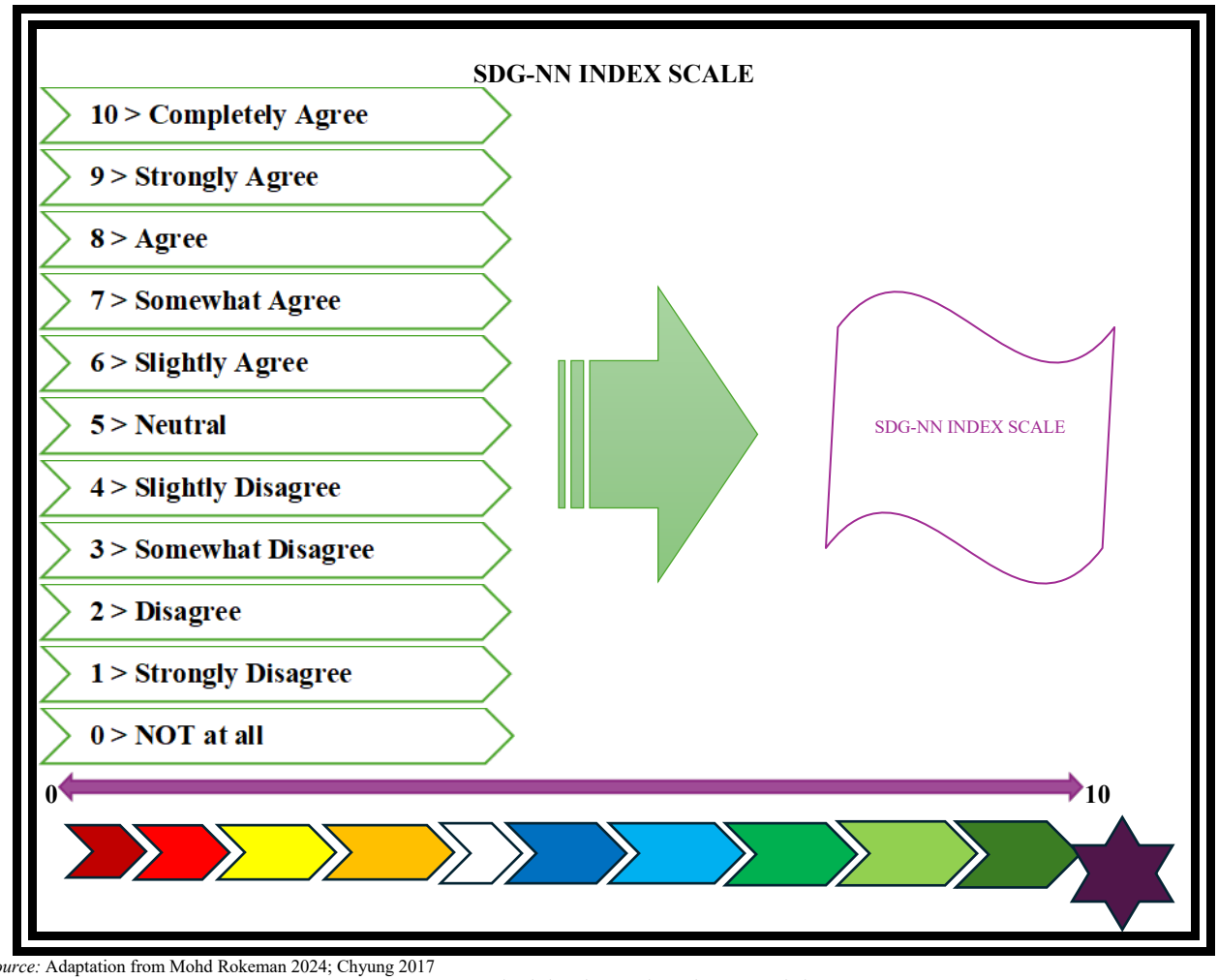
focus on longitudinal studies, cross-sector comparisons, and policy evaluations to refine these tools and ensure their relevance in diverse contexts.

METHODOLOGY

APPLYING THE LIKERT SCALE IN ASSESSMENT

The development of the assessment questions was based on adaptations from existing instruments that address work-life balance issues. Drawing from these established sources has contributed to the strength and reliability of the questions used in this assessment. Several prior studies and tools were referenced in the selection process (Chris Cutinha 2025; Surveyplanet.com 2024a; 2024b; 2024c).

To measure responses effectively, the assessment employs a Likert-type scale, which is widely recognised for evaluating attitudes and perceptions in social research (Mohd Rokeman 2024). Specifically, an 11-point scale ranging from 0 to 10 was chosen, incorporating a midpoint to allow for more nuanced responses (Chyung et al. 2017). The design of this scale is grounded in methodologies from previous studies that emphasize the development of robust and flexible measurement tools (Donaldson et al. 2023; Simms et al. 2019).



Source: Adaptation from Mohd Rokeman 2024; Chyung 2017

FIGURE 1. Simulation eleven-point scale SDG-NN index

Figure 1 illustrates the simulation of the SDG-NN Index, which serves as a key indicator for evaluating the work-life balance of manufacturing workers. This simulation is presented in an infographic format, visually representing the progression of the index from the lowest scale to the highest, with a maximum value of 10. The scale is designed to be compatible with statistical analysis tools such as SPSS, allowing for detailed examination of the data. Through this analysis, the index provides meaningful insights into the overall wellbeing of employees, offering a structured method to assess and interpret their work-life balance within the context of sustainable development.

Figure 1 is essential as it provides a comprehensive visual representation of the SDG-NN Index scale, enabling readers to clearly understand the structure and conceptual framework of the developed measurement model. It illustrates how the scale integrates selected Sustainable Development Goals (SDGs) with the PERMA+4 model to assess the levels of work-

life balance and wellbeing among workers. Visual frameworks are particularly valuable in complex, multidimensional assessments, as they facilitate conceptual clarity and enhance interpretability (Boateng et al. 2018). In this study, the figure serves not only as a schematic overview but also as a validation tool that demonstrates how the SDG dimensions (such as gender equality, decent work, and good health) are systematically linked to the PERMA+4 wellbeing components: Positive Emotion, Engagement, Relationships, Meaning, Accomplishment, and additional dimensions. Thus, the figure enhances transparency, strengthens construct validity, and provides an empirically grounded visualization of how the SDG-NN Index holistically measures wellbeing and work-life balance within the sustainability framework.

TABLE 2. Previous study using the Likert scale

Performance workers	(Donaldson et al. 2024)	Seven-point scale Begin with "Strongly disagree" till "Strongly agree"
SDG Assessment	Al-Shahrani et al. 2024	Five-point scale Begin with Strongly Agree till Strongly Disagree.
Measure of PERMA+4	(Donaldson et al. 2023)	Eleven-point scale 0 = "NOT at all" to 10 = "Completely 100%"
Positive Functioning at work	(Donaldson et al. 2022);(Lorenz et al. 2023)	Seven- point scale Begin with "Strongly disagree" till "Strongly agree"
Psychological Safety	(Fischer & Huettermann 2020)	Seven-point scale Begin with "Strongly disagree" till "Strongly agree"
PERMA	(Butler & Kern 2016), (Wammerl et al. 2019)	Eleven-point scale Begin with "Never" till "Always" Begin with "Not at all" till "Completely"

PERMA MODEL

The concept of worker wellbeing is multidimensional, particularly in relation to the workplace environment, and can be described through a set of factors that contribute to overall wellbeing. These factors serve as key elements in measuring individual dimensions of wellbeing (Wilczyński & Kołoszycz 2023). One of the foundational models in this area is the PERMA model, introduced by Martin Seligman (2011), which outlines five core elements of wellbeing: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment (Kun et al. 2017; Seligman 2011). This model provides a structured framework for understanding how various aspects of life and work contribute to psychological wellbeing.

THE PERMA+4 NEW MODEL

The PERMA+4 model introduces four additional elements that enhance the original PERMA framework, offering a more comprehensive understanding of worker wellbeing. These added dimensions have been shown to account for greater variance in workplace-related wellbeing and job performance (Donaldson et al. 2020). The model, introduced by Donaldson and colleagues (Donaldson et al. 2024), expands the scope of wellbeing assessment by incorporating factors that are particularly relevant in organisational settings. Figure 2 illustrates how the PERMA+4 framework has been integrated with selected SDG targets, chosen based on their relevance to measuring work-life balance and wellbeing among manufacturing workers. Despite the growing interest in this area, only a limited number of studies have explored the intersection of work-life balance and the SDGs (Gálvez et al. 2020). This highlights the importance and timeliness of developing assessments that link individual wellbeing with global sustainability goals.

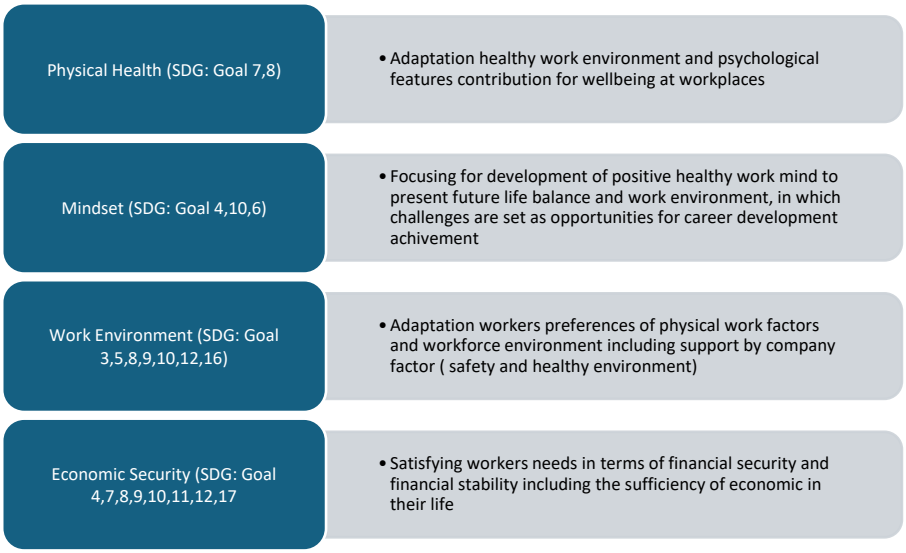


FIGURE 2. Elements combination of the PERMA+4 with SDG (Wilczyński & Kołoszycz 2023)

Figure 3 illustrates the sequence of steps involved in the development of the SDG-NN Index assessment. This process comprises seven key stages designed to ensure the validity and relevance of the indicator, making it suitable for application across multiple disciplines. The assessment aims to provide meaningful insights into the wellbeing and work-life balance of employees in the manufacturing sector. Moreover, the structure of this assessment is adaptable and can be extended to other employment sectors with similar objectives, thereby broadening its impact and utility.

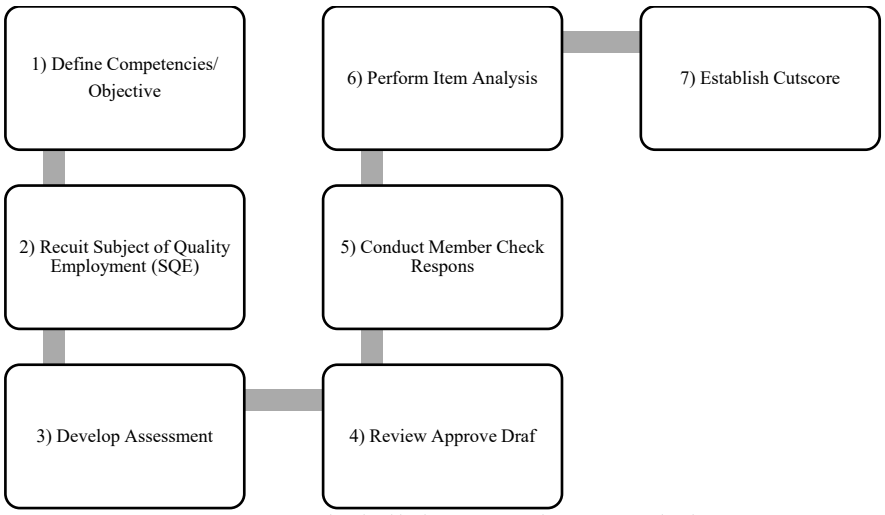


FIGURE 3. Steps involved in the SDG-NN Index assessment development process
Source: Adaptation from Guerin 2016

RECRUIT SUBJECT OF QUALITY EMPLOYMENT (SQE)

Drawing from previous research, the development of key assessment components often involves the inclusion of qualified Subject Matter Experts (SMEs) to validate the content and quality of assessment items (Guerin 2016; Linn et al. 1991). For the purposes of this assessment, a specialized framework known as the Subject of Quality Employment (SQE) was introduced to evaluate wellbeing and work-life balance in relation to quality of life, guided by relevant SDG targets. Work-life balance was identified as a critical indicator, particularly in response to the limitations and challenges that emerged during the post-pandemic endemic phase. This context has emphasised the role of both government and employers in safeguarding the wellbeing of workers in the manufacturing sector.

The SQE framework also provides the rationale for using a Likert scale ranging from 0 to 10, designed to capture levels of agreement, with higher values indicating stronger consensus. This scale is aligned with the PERMA model and allows for nuanced measurement of wellbeing-related responses. The data collected through this assessment will be analysed using SPSS software, enabling the calculation of average scores and response percentages to generate meaningful insights into employee wellbeing and work-life balance.

MEMBER CHECK REVIEW OF DEVELOPED ASSESSMENT QUESTIONS

Designing practical assessments can be challenging, particularly due to the potential for bias and validity issues (Little et al. 2012). The SDG-NN Index was developed to be versatile and applicable across various platforms, including digital formats such as webinars, email, and conversational technologies. These digital tools facilitate more efficient and comfortable engagement with the assessment, particularly for manufacturing workers.

Building on previous scholarly work, the SDG-NN Index integrates concepts and methodologies from earlier studies, adapting them to align with the goals and targets of the Sustainable Development Goals (SDGs). By combining elements of work-life balance and wellbeing, the assessment offers a more robust and relevant tool for evaluating employee experiences. This approach also reflects a broader commitment to promoting human wellbeing and sustainability in the post-pandemic era.

The assessment questions were developed based on previous studies that conducted tests to measure the elements of mental health, wellbeing, leadership, and work-life balance (SurveyPlanet.com 2024a; 2024b; 2024c). All these elements are closely related to the characteristics of the PERMA+4 model and the achievement targets outlined in the SDGs. Figure 4 explains the combination of the PERMA+4 model and the SDGs as the basis for guidance in developing our assessment questions.

The development of the SDG-NN Index is closely aligned with the SDG framework, focusing on enhancing wellbeing and healthy working environments. The questions included in the assessment were carefully constructed by merging features from the PERMA model and work-life balance indicators. Once the assessment was finalised, the member check

method was employed to validate its content. This process involved experts and professionals with backgrounds in manufacturing and human resources, ensuring the relevance and reliability of the questions.

The results from the member check provided sufficient evidence of the assessment's content validity. The involvement of experienced professionals from the manufacturing sector further reinforced the credibility of the instrument. As a result, a pilot test was deemed unnecessary for this study. However, future research may include pilot testing as part of a broader validation strategy in subsequent publications.

RESULT AND DISCUSSION

REVIEW BY MEMBER CHECK FOR THE VALIDITY OF QUESTIONS

The validation of assessment questions in this study is grounded in the member check method, a widely recommended approach in academic literature for establishing the reliability of research findings (Birt et al. 2016; Motulsky 2021). This assessment was designed to reflect the psychological wellbeing of employees, particularly in the context of work-life balance. Member checking plays a central role in confirming the relevance and clarity of the content and questions developed for this purpose. Content validity, in this context, refers to the extent to which the items in the assessment accurately represent the broader construct being measured (Straub & Gefen 2004). It is commonly used to evaluate the appropriateness of responses provided by experts in a specific field (Almanasreh et al. 2019).

Validating the assessment questions through member checks enhances the reliability of the SDG-NN Index and strengthens its overall development. Reviewers were selected based on their professional backgrounds and experience in manufacturing and human resource management, ensuring that the questions were suitable for workers in the manufacturing sector. Notably, few previous studies have employed member checking as a method for validating assessment tools, making this approach a distinctive feature of the current study.

In addition, the number of experts required in the member check was determined based on the number of participants involved in the qualitative approach. Member check is one of the approaches used in qualitative methods, which involves expert participation in the validity assessment (McKim 2023). At the initial stage of the member check process, a total of 12 experts were identified, and each of them was given a set of questions. However, only nine experts provided feedback, while three other experts did not respond. The background of the expert's respondents was those who work for several companies in Kedah and Penang. The experts were selected using the informant services method, which is very helpful in obtaining information about the experts and securing good cooperation from them.

At the initial stage of the member checking process, a total of 12 experts were identified, and each was provided with a set of questions to evaluate and validate the study's findings. The selection of this number was guided by established methodological recommendations in the literature on content validity and member checking procedures in qualitative research. According to Kishore (2021), there is no uniform standard for determining the exact number of experts required; however, a consensus suggests that a panel of 5 to 15 experts is adequate to ensure both diversity of perspectives and manageability of feedback. Similarly, Boateng et al. (2018) emphasise that content validity is typically assessed by expert panels to ensure both face and content validity. McKim (2023) further recommends that the number of participants involved in member checking should ideally include at least half, and preferably all, of the original participants to maximise feedback and validation. Therefore, the inclusion of 12 experts was considered appropriate, as it falls within the optimal range suggested by existing methodological guidelines and allows for the collection of sufficiently diverse viewpoints without compromising procedural efficiency. This decision is also consistent with the recommendations of Ahmad (2024) and Korstjens and Moser (2018), who highlight that the number of experts should reflect the study's design, resource availability, and the need for diverse perspectives to strengthen the validity and credibility of content.

A total of nine experts were involved in the member check process, all of whom have relevant experience in the manufacturing industry. Their responses were collected using Google Forms. This number exceeded the average number of experts typically used in similar studies (Boateng et al. 2018), further reinforcing the robustness of the validation process. Table 3 provides a detailed list of the reviewers and their professional backgrounds.

TABLE 3. List of reviewer/expert

No	Name of Member	Position	Company
1	Miss Rina	Admin Clerk	Manufacturing
2	Miss Aza	HR Manager	Service Company
3	Mr Syah	QA Engineer	Manufacturing
4	Mr Tuck	Asst. Eng. Production/ Technician Leader	Manufacturing
5	Mr Bal	Engineer Mechanical	Manufacturing
6	Mr Zam	HR Senior	Service Company/Manufacturing
7	Mr Umar	Former Department Leader	Manufacturing
8.	Mr Mir	Officer	SIRIM
9	Mr Syami	Production Supervisor	Manufacturing

Based on feedback from reviewers and experts, it was found that over 70% agreed with the questions included in the assessment. A smaller portion expressed disagreement, particularly with questions related to the impact of COVID-19 on job performance and productivity. This variation in responses may reflect differing personal experiences or perceptions of

the pandemic's effects. Overall, the pandemic has had a significant influence on employee performance and productivity across sectors (Hoo et al. 2025)

TABLE 4. Results of member check response

Section	Total Questions	Averages (%)
Company support	22	76.2
Work-life balance	30	84.8
Wellbeing	8	73.6
Total	60	78.2
Average time spent answering all questions: 10 to 15 minutes		

Table 4 presents the validation results of all assessment questions, categorized into three key sections: company support, work-life balance, and wellbeing. The overall average agreement across these sections is 78.2%, placing the assessment within the "strongly agreed" range of validity. This high level of agreement indicates that the questions are well-constructed and highly relevant for evaluating work-life balance among manufacturing workers. The successful validation of these questions reinforces the significance of the assessment and its potential contribution to advancing sustainability goals outlined in the SDG agenda.

Reviewer feedback also indicated that the time required to complete the assessment ranged between 10 and 15 minutes, depending on individual circumstances. This duration is considered appropriate given the number of questions included. Generally, survey completion times are estimated at around 5 minutes for 15 questions and approximately 10 minutes for a complete survey (Qualtrics.com, n.d.; Smartsurvey.com, n.d.). The time reported by reviewers suggests that the assessment was manageable and did not impose undue burden, thereby minimising the risk of response bias. Addressing such bias is crucial, as it can compromise the validity of the content and obscure the real issues being measured (Yan & Tourangeau 2008).

DISCUSSION

The PERMA+4 model, developed by Martin Seligman, focuses on individual psychological wellbeing through five core elements: Positive Emotion, Engagement, Relationships, Meaning, and Achievement, plus four additional components: Physical Health, Mindset, Environment, and Economic Security. It provides a comprehensive framework for understanding personal and workplace wellbeing. On the other hand, the SDGs, introduced by the United Nations, are a global blueprint for achieving a better and more sustainable future. They address broad societal challenges, including health, equality, decent work, and environmental sustainability.

By combining these two frameworks, it is possible to assess the intersection of individual wellbeing with global sustainability goals. This integration ensures that employee experiences are not only measured in terms of personal satisfaction but also aligned with broader organisational and societal responsibilities.

The overall average agreement of 78.2% across all sections indicates strong content validity. However, a closer look at the breakdown reveals important nuances. While the Work-Life Balance section received the highest level of agreement (84.8%), Company Support (76.2%) and Wellbeing (73.6%) showed relatively lower levels of agreement.

The lower agreement in the Wellbeing section may be attributed to several factors. First, wellbeing is inherently subjective and multifaceted, making it challenging to assess uniformly. Second, questions in this section may have lacked specificity or clarity, leading to varied interpretations. Third, cultural and organisational norms in manufacturing environments may discourage open discussions about mental health, contributing to discomfort or uncertainty in evaluating wellbeing-related questions.

These findings suggest that while the assessment tool is generally robust, certain areas, particularly those related to wellbeing require refinement. Employers may not be fully aware of how their practices affect employee wellbeing, or employees may not feel safe expressing concerns. This highlights the need for more precise, culturally sensitive, and actionable approaches to addressing these issues. Based on the assessment findings, the following strategies are recommended for employers:

To strengthen company support mechanisms, employers should begin by clearly communicating the resources available to employees, such as HR support, mental health services, and flexible scheduling options. These resources must be easily accessible and well-publicised to ensure that employees are aware of and feel comfortable using them. Additionally, managers should be trained to recognise signs of stress and burnout, and to actively support work-life balance through empathetic leadership and flexible management practices. Establishing anonymous feedback channels can further empower employees to voice concerns or suggestions without fear of reprisal, fostering a culture of openness and trust.

Enhancing wellbeing initiatives is equally critical. Employers can introduce targeted mental health programs, counselling services, and stress management workshops tailored to the unique challenges faced by manufacturing workers. Physical wellness should also be prioritised through ergonomic workplace designs, regular breaks, and health screenings. Beyond physical and mental health, fostering a sense of purpose and recognition in the workplace is essential. Aligning these efforts with the PERMA+4 model can help employees feel valued and engaged, contributing to a more positive and productive work environment.

Aligning workplace policies with Sustainable Development Goals (SDGs) can provide a strategic framework for long-term improvement. Employers should implement health-focused policies that support Goal 3 (Good Health and Wellbeing), promote fair wages, safe working conditions, and career development in line with Goal 8 (Decent Work and Economic Growth), and ensure inclusivity and gender equality as emphasised in Goal 5. These actions not only enhance employee wellbeing but also contribute to broader societal goals, positioning companies as responsible and forward-thinking organisations.

If the SDG-NN Index reveals that the "Relationships" dimension part of the PERMA+4 model is scoring low among manufacturing employees, it signals that workers may feel disconnected from their peers, unsupported by supervisors, or experience interpersonal conflicts at work. This can negatively impact morale, collaboration, and overall productivity.

To improve workplace relationships, managers can implement several practical strategies. One effective approach is to organize regular team-building activities, such as collaborative workshops, informal gatherings, or problem-solving games. These initiatives help foster trust, enhance communication, and build camaraderie among team members. Additionally, providing conflict resolution training equips both employees and supervisors with essential tools to manage disagreements constructively. This includes developing skills in active listening, empathy, and negotiation particularly valuable in high-pressure manufacturing environments. The member check validation process has provided valuable insights into the strengths and areas for improvement in the assessment tool. By refining these areas and implementing targeted strategies, employers can better support their workforce and make meaningful contributions to the SDG agenda.

The assessments developed by Boateng et al. (2018), Guerin et al. (2016), and Lorenz et al. (2023) collectively demonstrate rigorous, theory-driven approaches to instrument development, characterized by systematic validation, theoretical grounding, and stakeholder engagement. While Boateng et al. (2018) focused on psychometric scale construction using Classical Test Theory (CTT) and Item Response Theory (IRT), and Guerin et al. (2016) emphasised practical validation through expert involvement in occupational safety assessment, Lorenz et al. (2023) applied the PERMA+4 framework to link psychological safety with workplace wellbeing. Building upon these established methodologies, the current study introduces an innovative SDG-NN Index that integrates selected Sustainable Development Goals (SDGs) with the PERMA+4 model to assess work-life balance and well-being among manufacturing workers in the post-pandemic "New Normal." Unlike previous assessments that focused on specific domains, this study extends the application of the PERMA+4 model by embedding sustainability dimensions aligned with the SDG 2030 agenda. The use of member checking further strengthens content validity and contextual relevance. This integrative and cross-sectoral approach offers a novel contribution by providing a holistic, empirically validated framework for evaluating employee wellbeing and work-life balance across diverse industrial settings.

LIMITATION

In addressing the study's limitations, it is essential to acknowledge potential constraints related to the validity of the measurement model. While the assessment demonstrated acceptable levels of reliability and face validity through the member checking process, further validation is required to establish other types of validity, including discriminant, convergent, and predictive validity. Member checking, which involves obtaining feedback from experts to confirm the accuracy and relevance of the instrument's items, strengthened the content and face validity by ensuring that the constructs accurately represented experts' lived experiences and contextual realities. However, statistical validation such as confirmatory factor analysis (CFA) should be conducted in future studies to assess convergent validity (the degree to which indicators of the same construct are correlated) and discriminant validity (the extent to which constructs are distinct from one another). Additionally, predictive validity should be evaluated to determine whether the assessment can reliably forecast outcomes related to employee wellbeing and work-life balance. Therefore, while member checking enhanced the instrument's contextual credibility and interpretive accuracy, further quantitative validation is essential to reinforce the robustness and generalizability of the measurement model.

CONCLUSION

Measuring work-life balance and wellbeing is essential and requires ongoing refinement to remain effective. Key indicators typically include employee satisfaction surveys, evaluations of the work environment and employer support, productivity levels, and overall wellbeing. This assessment serves as a valuable feedback mechanism, offering insights into employees' perspectives and experiences. The SDG-NN Index plays a crucial role in this process and should be implemented regularly and consistently to monitor both individual wellbeing and organisational performance. Routine assessments enable organisations to adapt their strategies and better respond to employee needs, ensuring that work-life balance and wellbeing initiatives remain relevant, impactful, and aligned with broader sustainability goals.

The combination of PERMA+4 and the SDGs in the SDG-NN Index is not just a methodological choice; it is a strategic innovation. It transforms wellbeing from a personal concern into a shared responsibility, linking employee satisfaction with sustainable development. This synergy empowers employers to make informed decisions that benefit both their workforce and the wider community.

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Mohamad Sukor Abdul Karim (corresponding author)
Labour Economics (DEA)
School of Distance Education
Universiti Sains Malaysia
11800 USM, Pulau Pinang, MALAYSIA.
E-Mail: mohdsukorkarim@student.usm.my

Norhanishah Mohamad Yunus
Section Economic, School of Distance Education
Universiti Sains Malaysia
11800 USM, Pulau Pinang, MALAYSIA.
E-Mail: norhanishah@usm.my

Salfarina Abd Gapor
School of Business and Social Sciences
Albukhary International University
05200 Alor Setar, Kedah, MALAYSIA.
E-Mail: Salfarina.gapor@aiu.edu.my

Yong Salmah Nasir
Section Industrial Logistic
UNIKL MITEC
Persiaran Ilmu, Seri Alam, Johor, MALAYSIA.
E-Mail: yongsalmah@unikl.edu.my

Bahiah A Malek
INTI International University
71800 Nilai, Negeri Sembilan, MALAYSIA.
E-Mail: bahiah.amalek@newinti.edu.my