Lesson learnt from behavioural design to advancing energy inclusion: Sustainable entrepreneurship approach

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Abstract. *Objective: This study explores the integration of behavioral design principles into sustainable entrepreneurship to advance energy inclusion. Drawing upon the ABC of Productivity Award framework, which encompasses Activators of Productivity, Behaviors of Value Creation, and Consequences of Productivity, the research identifies and analyzes elements conducive to energy-saving behaviors and sustainable practices. By applying behavioral change strategies, the study aims to provide actionable insights for entrepreneurs to promote energy efficiency and inclusivity within productivity improvement initiatives. Method: Employing a case study approach, this research focuses on the ABC of Productivity Award to extract and analyze criteria, sub-criteria, and tips relevant to energy inclusion. Through systematic examination, the study identifies elements within the framework conducive to energy-saving behaviors and sustainable practices. By categorizing and analyzing these findings, the research provides practical guidelines for integrating energy inclusion into entrepreneurship initiatives. Results: The findings showcase the effectiveness of integrating behavioral design principles, such as award design, nudging, and gamification, into sustainable entrepreneurship. The ABC of Productivity Award model provides a structured framework for integrating these principles, with sections emphasizing social interests, sustainable practices, and productivity outcomes. While the model demonstrates moderate integration of energy inclusion and sustainability, enhancing focus on these elements could further strengthen its ability to drive comprehensive productivity improvements aligned with sustainable practices. Originality: This study contributes to the discourse on sustainable entrepreneurship by elucidating the synergy between behavioral design principles and energy inclusion. By providing practical insights derived from the ABC of Productivity Award framework, the research underscores the importance of integrating behavioral strategies to promote energy efficiency and inclusivity within entrepreneurial endeavors. Ultimately, the study advocates for creating environments and systems that naturally guide individuals towards sustainable behaviors, thereby advancing energy inclusion and fostering long-term positive changes.*

Keywords*: design thinking, persuasive technology, behavioural design, gamification, sustainable entrepreneurship, energy inclusion*
JEL classification*: E61, N70, D90, A19, Q56, Q49*

1. Introduction

Across a range of industries, behavior design employs various mechanisms to shape and influence actions, with incentive systems—particularly award design—playing a crucial role due to their alignment with the brain's reward pathways. While recognition programs are widespread in sectors such as business and manufacturing, customized award models remain relatively uncommon. This study investigates a unique example: an award developed specifically to promote sustainability in the mineral sector.

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Enhancing productivity is fundamental to achieving long-term sustainability in any industry, including critical areas such as mining. Operational efficiency in this field is closely tied to productivity, which encompasses increasing output, minimizing operational costs, and fostering continuous improvement (Lanke et al., 2016; Warhurst & Bridge, 1996; Zhironkina & Zhironkin, 2023). In primary industries like mining, improvements in productivity can influence multiple levels of the supply chain, reinforcing its role in generating sustainable value (Humphreys, 2020; Makinde et al., 2014; van Berkel, 2007).

This paper explores the conceptualization and deployment of a sector-specific recognition initiative known as the "ABC of Productivity." This award is designed to stimulate productivity enhancements across the mining industry, with a strong emphasis on energy efficiency and management.

In response to growing demands for innovative organizational strategies and better resource utilization (Shimaponda-Nawa et al., 2023), the study puts forward the case for an integrated and evidence-based productivity award. Despite the existence of general productivity awards, there remains a notable absence of industry-specific frameworks designed to meet unique sectoral challenges (Seifullina et al., 2018). Our case study focuses on Iran's mining industry and identifies a range of intertwined issues—technical, operational, and environmental— that complicate efforts to achieve both productivity and sustainability goals (Alves et al., 2021).

The convergence of behavior design with sustainable entrepreneurship provides a compelling framework for encouraging energy-conscious practices. Drawing from established behavioral frameworks such as lean startup methodology, customer creation, and the principles of Nudge Theory, we propose a three-phase model encompassing pre-usage, active usage, and post-usage stages. Each phase incorporates behaviorally-informed interventions aimed at fostering energy-saving habits and promoting efficient consumption.

Rather than relying solely on technological advancements or renewable energy sources, our approach emphasizes behavioral shifts as a powerful tool for realizing energy and performance gains. By implementing interventions grounded in human-centered design, the model offers practical pathways for integrating theoretical concepts into real-world sustainable entrepreneurship initiatives.

In conclusion, this research integrates the enhancement of productivity with behavioral design strategies to present a comprehensive model for advancing sustainability and energy inclusion, especially in complex industrial settings like mining. Through targeted frameworks and applied methodologies, the study aims to support continuous advancement and meaningful impact in sectors that are vital to global development.

2. Literature review

Behavioral design is a fascinating and dynamic branch of design dedicated to influencing how people act through thoughtful and strategic design interventions. It is rooted in the powerful concept that our daily interactions with objects, environments, and systems can significantly shape our decisions and behaviors. Drawing on behavioural change theories that explore how individual, behavioural, and environmental elements interact, designers craft interventions that gently steer people toward more secure, healthy, and sustainable decisions (Thaler & Sunstein, 2008).

The essence of behavioral design lies in its ability to apply psychological principles and empirical research to design environments that facilitate desired behaviors. For example, nudging techniques involve making small changes in the way choices are presented to steer people towards more beneficial decisions without restricting their freedom of choice (Sunstein, 2014). This approach can be seen in various contexts, from encouraging better health habits—such as using smaller plates to reduce food intake—to promoting greener lifestyles by placing recycling bins in convenient locations.

Behavioral design significantly contributes to both safety and the quality of social interactions. Urban environments, for example, can be structured to promote community engagement and interpersonal connections through features such as communal seating and accessible green areas (Gehl, 2011). In terms of crime reduction, the strategic use of environmental design—such as enhancing lighting and enabling natural surveillance—can discourage unlawful behavior and enhance public perceptions of security (Cozens, Saville, & Hillier, 2005).

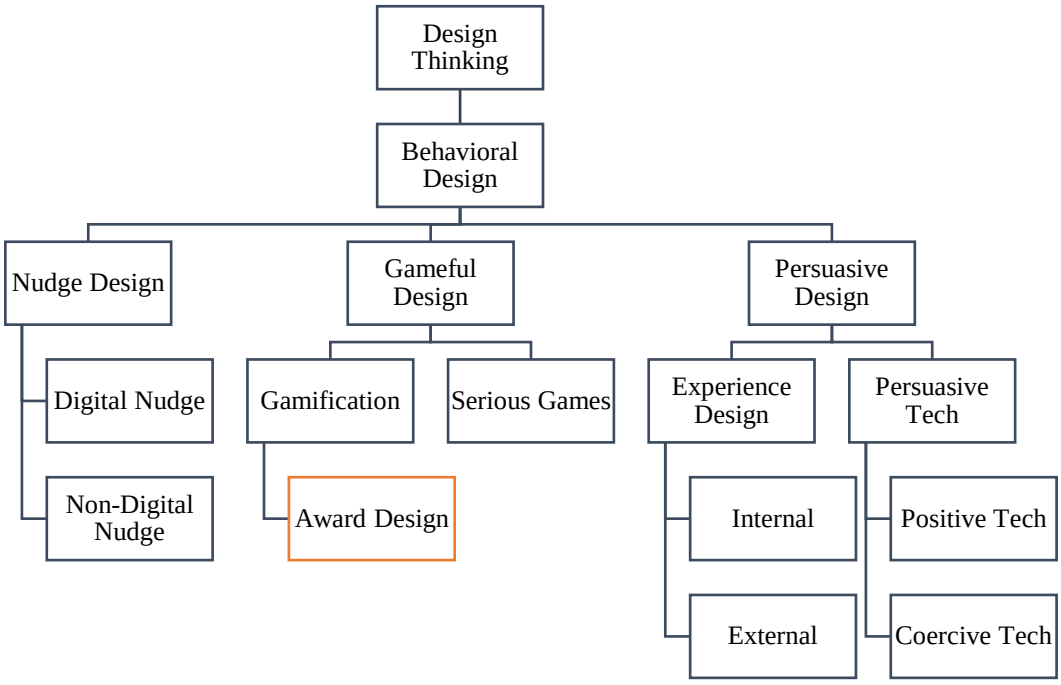
At its core, behavioral design is about shaping environments that nudge individuals toward healthier and more constructive choices, drawing on insights from psychology, design, and environmental science. Its influence is visible across various domains—from user-friendly digital platforms that foster positive interaction, to workspaces tailored to boost employee well-being and performance, and even public health initiatives designed to improve vaccine participation.

By leveraging these interdisciplinary principles, behavioral designers are equipped to develop solutions that are more intuitive and aligned with human behavior, ultimately leading to improved life outcomes and societal benefit. As the discipline advances, its capacity to address major global issues—such as environmental sustainability, health emergencies, and social inequality—continues to expand with great potential.

Behavioral design is intrinsically linked to the broader field of design thinking, which focuses on understanding and solving complex problems through a user-centered approach. Design thinking emphasizes empathy, ideation, and experimentation, which are foundational principles in behavioral design as well. Behavioral design specifically aims to influence human behavior positively by integrating insights from psychology, economics, and design.

There are several key types of behavioral design, each serving different purposes and applications. Persuasive technology leverages principles from persuasive design to guide users toward certain behaviors. This approach is often seen in social media platforms using notifications to increase user interaction or e-commerce sites using urgency cues to drive purchases (Fogg, 2003). Gamification incorporates game mechanics into non-game and serious contexts to boost involvement and motivation. Examples include fitness apps that reward users with points or badges for completing workouts, transforming mundane tasks into rewarding experiences (Deterding et al., 2011). Nudge Management, popularized by Richard Thaler and Cass Sunstein, involves subtle environmental adjustments that encourage desirable behavior without limiting choices (Thaler & Sunstein, 2008). This can be observed in practices such as placing healthier foods at eye level in cafeterias or setting default options for retirement savings plans. Each type of behavioral design offers unique strategies to address challenges across various fields, from public health to user experience design, by fostering positive behavior changes through thoughtful and empathetic design.

Figure 1. Types of behavioural design



Source*:* developed by the author.

Award design plays a crucial role in gamification and aligns closely with the core tenets of behavioral design by using incentives to shape and encourage desired actions. This approach draws on psychological constructs such as intrinsic motivation and positive reinforcement to engage users in constructive behaviors. Rewards may take various forms—ranging from points and badges to trophies or material incentives—and are intentionally distributed upon the achievement of predefined goals or tasks. For example, fitness applications frequently utilize digital badges to acknowledge users who meet specific fitness milestones. This method enhances motivation, promotes a sense of achievement, and increases user retention (Hamari, Koivisto, & Sarsa, 2014). Likewise, educational technology platforms often confer certificates or badges upon successful course completion or high performance, fostering ongoing participation and knowledge acquisition (Deterding, 2011).

In a corporate context, awards such as the European Foundation for Quality Management (EFQM) Excellence Award and the Deming Prize celebrate high-performing organizations that consistently pursue excellence and innovation. These recognitions serve not only as accolades but as strategic tools that drive the adoption of structured quality management systems, leading to improved performance and competitiveness. Award-based systems also have implications for broader societal goals, such as promoting energy efficiency. For example, energy providers can implement incentive schemes that reward individuals and businesses for lowering energy consumption or adopting energy-efficient technologies. Such initiatives, by recognizing positive contributions, can galvanize wider participation in sustainability efforts and support progress toward reducing energy poverty.

The mining sector, like other industrial domains, is pivotal to global economic activity and remains under constant pressure to optimize productivity (Tausova et al., 2017). Scholars have explored numerous drivers of performance in these contexts (Humphreys, 2020; Mishra et al., 2023). Quality Management (QM) serves as a fundamental approach to improving productivity by ensuring continuous refinement of processes, organizational culture, and outputs to exceed stakeholder expectations (Evans & Lindsay, 2016). Business Excellence Models (BEMs), including EFQM, act as frameworks for implementing QM practices that support strategic productivity enhancements (Sousa et al., 2023).

A substantial body of evidence affirms the benefits of deploying excellence frameworks on organizational outcomes (Castilla-Gómez & Herrera-Herbert, 2015; Hendricks & Singhal, 2001; Zapletalová, 2022; Carlos Sá et al., 2023). Yet, criticisms persist, particularly concerning the contextual adaptability and integration of these models into organizational culture (Dahlgaard et al., 2013; Ritchie & Dale, 2000). While Business Excellence Frameworks (BEFs) are frequently cited as roadmaps to superior performance, their impact is often mediated by organizational context and implementation fidelity (Zelenyuk, 2023).

In today's volatile, uncertain, complex, and ambiguous (VUCA) business landscape, adaptability and responsiveness are essential (Carvalho et al., 2021; Suciu, 2011). Despite this, discussions on the alignment of BEMs with these modern challenges remain limited (Saleh & Watson, 2017). Traditional excellence awards such as the Malcolm Baldrige National Quality Award (MBNQA), EFQM, and the Swedish Institute for Quality (SIQ) have been criticized for not fully addressing the dynamics introduced by the Fourth Industrial Revolution (Enquist et al., 2015). Emerging research underscores the necessity for revising these models to better fit the demands of a digitally driven, innovation-centered economy (Goecks et al., 2020; Samadhiya et al., 2024).

Business Excellence Models are structured around defined criteria that encompass both enablers and results, grounded in foundational principles and values of excellence. The ABC of Productivity Award, introduced in 2023, is a contemporary adaptation that integrates three dimensions: Activators of Productivity (e.g., Leadership and Strategic Culture), Behaviors of Value Creation (e.g., Human Capital and Sustainability), and Consequences of Productivity (e.g., Perceptual, Operational, and Financial Outcomes).

By blending gamification techniques with the established frameworks of business excellence, award systems can be engineered to not only stimulate productivity and innovation but also to encourage energy-efficient behavior and sustainable development. This integrated strategy provides a multidimensional approach to continuous improvement, making it a powerful tool for addressing both economic and environmental challenges.

3. Data and methodology

This research follows a qualitative case study methodology, focusing on the "ABC of Productivity," an Iranian award designed to promote productivity improvement within organizations. The study aims to evaluate how sustainability and energy management are integrated within the award's framework.

The sample for this case study consists of the guidance tips embedded within the award criteria, totaling 197 tips. Each tip represents a specific instruction or recommendation aimed at enhancing productivity across various dimensions. To ensure a comprehensive analysis, all 197 tips were meticulously examined, and any tips that directly mentioned or emphasized sustainability and energy management were identified and selected as the final sample for deeper analysis.

The study categorized the guidance tips into three main sections of the productivity model:

- Activators of Productivity – which includes elements such as Cultural Leadership and Productivity Strategic Model.
- Behaviors of Value Creation – encompassing areas like Human Resource, Capital and Capabilities, and Responsible Value Creation.
- Consequences of Productivity – covering outcomes such as Attitude based, Performance based, and Financial Results.

In each section, tips related to energy inclusion and sustainability were isolated to understand their prominence in different aspects of productivity. This approach enabled the researcher to assess the extent to which energy management and sustainable practices are prioritized within the award's framework.

By adopting this case study method and focusing on the guidance tips as the sample, the research provides a detailed account of the presence (or lack) of energy and sustainability considerations in the productivity criteria of the ABC award. This methodological approach offers a clear view of how sustainability is treated within a structured, national-level productivity framework in the context of the Iranian Mines and Mining Industries.

4. Research results and comments

The analysis of the ABC of Productivity Award reveals a varied distribution of guidance tips related to energy inclusion and sustainability across its three main components: Activators of Productivity, Behaviors of Value Creation, and Consequences of Productivity. The findings are summarized in the following table:

Table 1. Guidance tips related to Sustainable Energy Inclusion

Dimension	Criterion	Guidance Tip(s)
Activators	Leadership and productivity culture	1. In their decisions, they consider social interests, environmental issues, sustainable employment and creating common value with society.
	Strategy and Productivity Model	1. Considering the nature of the organization's business, they develop their unique productivity model based on the framework of common productivity models and comprehensive quality management.
Behaviors	People	1. They manage the knowledge, skills and capabilities of employees based on the competency profile of technological shift and with the aim of increasing productivity.
	Resources and Capabilities	1.They manage energy consumption (water, electricity, gas and fuel) according to productivity components and within the framework of common standard systems. 2.The processes of the organization are managed in an integrated manner according to the components of productivity, agility and reduction of losses, mechanization and related information systems.

Dimension	Criterion	Guidance Tip(s)
		3. They manage research and innovation projects to solve operational problems, reduce waste and improve productivity indicators.
	Sustainable Value Creation	1. They manage the procurement of goods and services and energy requirements of the value chain with an emphasis on sustainable supply and productivity components. 2. Special uses of raw materials, efficiency and utilization of production capacities are managed with problem solving techniques. 3. Environmental requirements are included in equipment development and renovation plans according to the components of cyclical economy.
Consequences	Perceptual Results	1. Satisfaction with the sustainable development of civil, social, and business infrastructures 2. Satisfaction with compliance with environmental and legal standards 3. Satisfaction by minimized waste and maximized use of available resources (circular economy)
	Performance Results	1. Compliance of environmental indicators with respect to the permitted limit
	Financial Results	1. Productivity of raw materials 2. energy efficiency 3.Machine productivity

Source*:* developed by the author.

In the Activators of Productivity section, which includes critical components such as Productivity Culture Leadership, and Productivity Strategic Model, only 2 out of 32 guidance tips (6%) are focused on energy inclusion and sustainability. This demonstrates a relatively low emphasis on these aspects within the foundational elements of the productivity framework. Given the growing importance of sustainable practices in business, this finding indicates that energy inclusion and sustainability are not yet seen as essential drivers of productivity at the strategic level in this model.

In the Behaviors of Value Creation section, which covers areas like HR, Capital and Capabilities, and Responsible Value Creation, 7 out of 56 guidance tips (12%) are related to energy inclusion and sustainability. This suggests a more substantial focus on integrating sustainable practices and energy management within the operational and value creation processes of organizations. It highlights that sustainability is recognized as important in how businesses create value but remains underrepresented compared to other operational aspects.

The Consequences of Productivity section, which evaluates outcomes such as Attitude based, Performance based, and Financial Results, includes 7 out of 109 guidance tips (6%) related to sustainability and energy inclusion. While these results indicate that sustainability is considered in evaluating productivity outcomes, it is not a dominant criterion. This could suggest that while energy inclusion and sustainability are acknowledged, they are not yet seen as primary indicators of successful productivity.

Overall, the ABC of Productivity model has 8% of its guidance tips related to energy inclusion and sustainability. This moderate integration reflects some attention to sustainable practices, but there is clear room for improvement, particularly in the foundational and outcome-oriented sections of the framework. Increasing the focus on energy inclusion and sustainability, especially in strategic leadership and performance evaluation, could enhance the model's effectiveness in promoting comprehensive productivity improvements aligned with sustainable practices and energy-efficient operations.

The analysis of the ABC of Productivity model reveals important insights into how sustainability and energy inclusion are integrated into its framework. Specifically, the data shows that in the Activators of Productivity section, which includes critical strategic elements like Leadership, Productivity Culture, and Strategy and Productivity Model, only 2 out of 32 guidance tips (6%) address energy inclusion and sustainability. This is a relatively low emphasis on these aspects at the strategic

level, which is particularly concerning given the growing global importance of sustainable practices. In today's business environment, sustainability is increasingly seen as a fundamental driver of long-range success and resilience, yet the ABC of Productivity model reflects a gap in recognizing these issues as core components of productivity strategy.

Table 2. Proportion of Sustainable Energy Inclusion

Section	Total Guidance Tips	Tips Related to Energy Inclusion and Sustainability	Percentage of Related Tips
Activators of Productivity	32	2	6%
Behaviors of Value Creation	56	7	12%
Consequences of Productivity	109	7	6%
Total	197	16	8%

Source: developed by the author.

Strategic management theories, such as the resource-based view (RBV), emphasize that organizations must build sustainable competitive advantages through valuable, rare, and inimitable resources (Mohammadian & Shafiei Bafti, 2023). Incorporating sustainability into leadership and strategic models could help organizations leverage resources such as energy efficiency and environmental stewardship to maintain a long-term competitive edge. This misalignment in the ABC of Productivity suggests that while traditional drivers of productivity like leadership and culture are well-represented, there is insufficient recognition of energy and sustainability as essential to strategic competitiveness.

In contrast, the Behaviors of Value Creation section, which covers areas like People, Resources and Capabilities, and Sustainable Value Creation, shows a relatively stronger inclusion of sustainability, with 7 out of 56 tips (12%) focused on energy inclusion and sustainability. This demonstrates that operational processes and value creation activities are more attuned to sustainable practices compared to the strategic level. This is consistent with modern business approaches that recognize the role of sustainable practices in enhancing efficiency, reducing waste, and generating value in day-to-day operations. The emphasis on sustainability in the operational processes aligns with theories like Porter's Value Chain, where sustainable resource management can enhance productivity by optimizing inputs and minimizing environmental impacts.

Despite growing attention, sustainability is still not a central focus at this stage. The rise of innovative technologies—such as the Internet of Things (IoT), artificial intelligence (AI), and sharing-based economic models—offers valuable potential to embed sustainability more deeply into productivity strategies. IoT facilitates enhanced resource efficiency by enabling real-time data collection and monitoring of energy use, while AI supports the identification of wasteful processes and fosters smarter, sustainability-oriented decision-making. Additionally, the sharing economy introduces alternative approaches to consumption that prioritize resource optimization and waste reduction. These developments highlight the need for updated guidance that incorporates these technological advancements.

The Consequences of Productivity section, which evaluates outcomes such as Perceptual Results, Functional Results, and Financial Results, contains 7 out of 109 tips (6%) related to sustainability and energy inclusion. This indicates that sustainability is acknowledged in the outcome measures but does not serve as a primary criterion for evaluating productivity results. In comparison to global trends, productivity models are increasingly integrating sustainable outcome measures into performance evaluations, focusing on metrics like environmental impact, carbon footprint reduction, and long-term resource sustainability. Models like the EFQM (European Foundation for Quality Management) and Malcolm Baldrige Performance Excellence Award have increasingly incorporated sustainability into their frameworks as central to organizational excellence, underscoring the need for the ABC model to follow this trend.

Overall, only 8% of the total 197 guidance tips in the ABC of Productivity model relate to energy inclusion and sustainability, reflecting a moderate but incomplete integration. While this is a

good start, it falls short of fully recognizing sustainability as a key driver of productivity across the board. Given technological advancements and the increased focus on sustainability in global business practices, expanding the model to better incorporate modern concepts like circular economy, AI-driven efficiency, and sustainable leadership is essential for maintaining relevance.

This analysis underscores the need for the ABC of Productivity model to evolve in order to remain competitive and relevant in a global landscape where sustainability is no longer optional but a necessity. Improving the focus on energy inclusion and sustainability in both strategic leadership and outcome measurement could enhance the model's ability to foster comprehensive productivity improvements that align with modern sustainable practices and energy-efficient operations.

5. Conclusions

This study explores the integration of behavioral design principles into sustainable entrepreneurship to advance energy inclusion. Entrepreneurs who grasp and utilize behavior change approaches are better positioned to create meaningful interventions that encourage sustainable habits and energy conservation. Strategies like designing incentive systems, employing nudges, and integrating persuasive technologies have demonstrated success across multiple fields and hold potential for driving improvements in both energy efficiency and social inclusion.

Award design, a critical component of gamification, effectively motivates individuals and businesses to adopt energy-efficient technologies and practices through tangible rewards and recognition. This method harnesses the power of positive reinforcement to drive long-term behavior changes. For instance, the UK's "Green Deal" program and the U.S. "Energy Star" initiative have successfully encouraged the adoption of energy-efficient measures by offering financial incentives and certification labels, respectively.

Nudging techniques subtly steer individuals toward more sustainable choices without restricting their freedom. Programs like Opower's personalized home energy reports demonstrate how comparative usage data can effectively reduce energy consumption. Entrepreneurs can leverage such techniques by setting default green energy options and providing real-time feedback on energy usage.

Gamification and interactive engagement further enhance user motivation and participation. Projects like Japan's Eco-Island, which used points and competition to encourage energy-saving activities, illustrate the potential of gamified approaches to foster community involvement and significant energy savings. Designing interactive platforms with leaderboards, achievements, and social sharing can make energy conservation more engaging and competitive.

Educational campaigns and awareness initiatives play a crucial role in promoting energy conservation. Global movements like WWF's "Earth Hour" not only save energy during the event but also raise awareness and inspire long-term behavioral changes. Entrepreneurs should conduct multimedia campaigns and community events to disseminate practical energy-saving tips and highlight the importance of conservation.

The ABC of Productivity Award model, studied in this research, provides a structured framework for integrating these principles into productivity improvement initiatives. The model comprises three main parts: Activators of Productivity, Behaviors of Value Creation, and Consequences of Productivity, each with criteria and sub-criteria related to energy inclusion and sustainability.

Activators of Productivity: This section includes guidance on considering social interests, environmental issues, sustainable employment, and creating common value with society. It emphasizes developing unique productivity models based on common productivity frameworks and comprehensive quality management. However, only 6% of the guidance tips in this section pertain to energy inclusion and sustainability.

Behaviors of Value Creation: This section focuses on managing the knowledge, skills, and capabilities of employees in line with technological changes and productivity goals. It also covers managing energy consumption, reducing waste, and integrating environmental requirements into equipment development. This section contains 12% of the guidance tips related to energy inclusion, reflecting a stronger emphasis on sustainable practices.

Consequences of Productivity: This section evaluates outcomes such as satisfaction with sustainable development, compliance with environmental standards, minimizing waste, and

maximizing resource use. While only 6% of the guidance tips in this section are related to energy inclusion and sustainability, it highlights the importance of environmental indicators and energy efficiency in measuring productivity results.

Overall, the ABC of Productivity Award model has 8% of its guidance tips related to energy inclusion and sustainability, indicating a moderate integration of these elements. Enhancing the focus on sustainability within the foundational and outcome-oriented sections could further strengthen the model's ability to drive comprehensive productivity improvements aligned with sustainable practices.

In conclusion, the synergy between behavioral design and sustainable entrepreneurship not only enhances the impact of energy initiatives but also ensures these solutions are user-friendly and widely adopted. By integrating these principles, sustainable entrepreneurs can develop innovative strategies that promote energy inclusion, contributing to a more responsible and sustainable future. The insights and practical strategies derived from this research underscore the importance of creating environments and systems that naturally guide individuals toward sustainable behaviors, ultimately advancing energy inclusion and fostering long-term positive changes.

One limitation of this research is the context-specific nature of the model, as it is designed for the Iranian mineral industry, which restricts its generalizability to other industries or countries. Future studies could extend the analysis by comparing various excellence models globally, such as the EFQM and Malcolm Baldrige awards, regarding their attention to sustainability, energy inclusion, and responsible behaviors. Additionally, future models must address the potential of emerging technologies like IoT, AI, and blockchain in promoting sustainable practices, waste management, and energy efficiency. Expanding the scope of productivity frameworks to incorporate these advancements will be critical for fostering more responsible and resilient organizations.

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