

Real- Time Bi-enhanced Product Performance Intelligence for Driving Sustainable Business Expansion

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Abstract: In volatile markets plagued by regulatory pressures and sustainability challenges, regular product performance monitoring systems have often been characterized by delayed insights, data silos, and poor integration of Environmental, Social, and Governance (ESG) metrics. In this conceptual paper, Real-Time BI-Enhanced Product Performance Intelligence is proposed as a novel framework for driving sustainable business growth. The framework combines the real-time streams of data coming in from different sources—sales, operations, customer feedback, and ESG indicators—into advanced BI processing, producing immediate and actionable KPIs. It attempts to align product performance metrics with sustainability objectives like resource efficiency, carbon emission, and circular economy principles, ultimately feeding into approaches for resilient growth and innovation. On the basis of existing literature on BI evolution, product management, and sustainability theory, the proposed framework captures critical gaps in the existing approaches and makes advancements in theoretical integration by postulating real-time BI as a mediating force between operational performance and sustainable outcomes. Three testable propositions connect real-time analytics with visibility, balanced decision-making, and sustainable competitive advantage. Practical implications will include recommendations for establishing integrated dashboards, whereas obstacles to implementation, like data privacy, integration costs, and skill gaps will also be examined. Introducing a framework helps to create the basis for further empirical research and provides actionable insights for organizations aspiring to turn a profit while

being environmentally and socially responsible in markets with compliance pressures.

Keywords: Business Expansion, Business Intelligence, ESG Metrics, Product Performance, Real-Time Analytics, Sustainability

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1.0 Introduction

Traditional product performance monitoring systems are increasingly inadequate in volatile, data-intensive markets due to delayed reporting cycles, fragmented data architectures, and limited analytical responsiveness. In the face of an ever-changing global economy, we see the emergence of huge challenges to the queue for timely actionable intelligence through some traditional parametric metrics (Abolade & Zhao, 2024). These chase after knowledge from authorized regular reporting cycles and continued doubts by the more disillusioned consumers of the usefulness of such delayed

insights failing to capture volatile consumer preferences, disruptions to the product supply chain, or competitive pressures with all their swiftness (Möller *et al.*, 2020). Such slow insights mean existence of missed opportunities leading to substantially suboptimal decision-making primarily in the fast-paced, innovation-focused industries with very short life spans of a product (Bergmann *et al.*, 2020; Chowdhury, 2024). Time and again, traditional product monitoring systems forget the very basic concept of integrated thinking, and they still run on siloed data foundations. Truly integrated systems could address IBC challenges through a broader, comprehensive view to unlock agility (Adewusi *et al.*, 2024; Kurpiela & Teuteberg, 2024).

Despite the strategic importance of ESG compliance, most organizations lack real-time mechanisms for embedding sustainability metrics directly into product performance decision-making. Another very significant development is with sustainability in business (Abolade, 2023). At one time, EU-based regulatory pressures-CSR and a pegged supply chain tie-in sought greater disclosure for monitoring, which was to provide more overview about environmental impacts, resource efficiency, and governance in the social context (Zheng & Bu, 2024; Yang *et al.*, 2024). Resource efficiency is gaining ground due to increasing energy costs and vulnerable supply chains, with many companies facing demands for waste minimization, judicious material use, and efficacious circular economy transitions (Baratta *et al.*, 2023; Kong *et al.*, 2024). ESG indices are now considered tantamount to ultimate corporate sustainability, and all stakeholders are looking less on return on investment and more toward accepting those with fewer footprints and ethical practices (Cheng *et al.*, 2023; Tan *et al.*, 2024). Non-corporate evaluation of environmental, social, and governance performance metrics carries an increased risk of reputational scorn, legal enforcement, and further investor alienation, as

globalized paradigms like the Sustainable Finance Disclosure Regulation (SFDR) begin to put in place anti-doublespeak practices (Luo *et al.*, 2024; Zhang *et al.*, 2024).

Yet, the extant product performance intelligence is just not up to the mark (Ademilua & Areghan, 2022). Delays have historically tied their distinctiveness to batch processing and manual aggregation, making their real-time strategic employment out of the question. Another hurdle for the practice of genuine consolidated product metrics with sustainability metrics is, not surprisingly, partitioning data structures, the very defined word meaning fragmentation, so that information is kept across divisions' sales, operations, marketing, and customer feedback, giving conflicting metrics and no real ability to track product performance with clarity (Chowdhury, 2024; Zanke & Sontakke, 2024). Similarly, the premise that ESG factors are brought into product intelligence frameworks but not at any scale leads to disjointed strategies, wherein performance optimization is disconnected from environmental and social impact; thus, growth is severely hindered by absence of any input or kind. (Yang *et al.*, 2024;). Little emphasis on the ecological and social dimension of product intelligence indicates the incapacity of containing company objectives that align with sustainability, thus making harder the coping of resource efficiency with missed competitive edges for novelties about green products or processes (Kong *et al.*, 2024; Cheng *et al.*, 2023). Despite extensive research on business intelligence, product performance management, and sustainability reporting, existing studies largely treat these domains in isolation. There is limited conceptual integration of real-time BI with product performance intelligence that simultaneously incorporates sustainability and ESG metrics as core analytical dimensions. This gap constrains organizations' ability to align rapid decision-making with long-term sustainable growth objectives.



This study is among the first to conceptualize real-time BI as a mediating mechanism that integrates product performance intelligence with sustainability-driven business expansion. Introducing a framework to execute real-time performance intelligence enhanced by an ultimate AI Business Intelligence (BI) system big enough for sustainable business expansion, we propose a new model in which ongoing businesses are conceptualized where on-the-fly BI tools are engaged for the processing of divergent streams of sales, quality, customer feedback, and ESG metrics to generate immediately usable intelligence. Sustainability indicators will be thrust in the mix: Resource efficiency and carbon emission will be incorporated into performance monitoring; hence, firms may now pursue growth that rests on a delicate balance between profitability and valuing nature.

Theoretically, this research takes the integration of sustainable BI theories to the next level by providing a fresh conceptual framework linking real-time analytics to

sustainability outcomes. The next step in this type of strategy requires outlining a plan using data-driven devices and software such as dashboards and predictive modeling to help pace the velocity of expansion, under the current market constraints and regulatory frameworks. This paper follows this structure: Section 2 gives the literature review on BI, product performance, and sustainability. Section 3 exhibits the proposed conceptual framework and propositions. Section 4 relates to implications, challenges, and future research directions. Section 5 concludes on a keypoint. The framework can offer value to scholars by extending BI theory, and to managers and policymakers by enabling data-driven, sustainability-aligned product strategies.

Fig. 1 provides a conceptual illustration of how organizations transition from fragmented, individual-level actions to system-wide value creation through increasing levels of coordination, integration, and strategic intelligence.

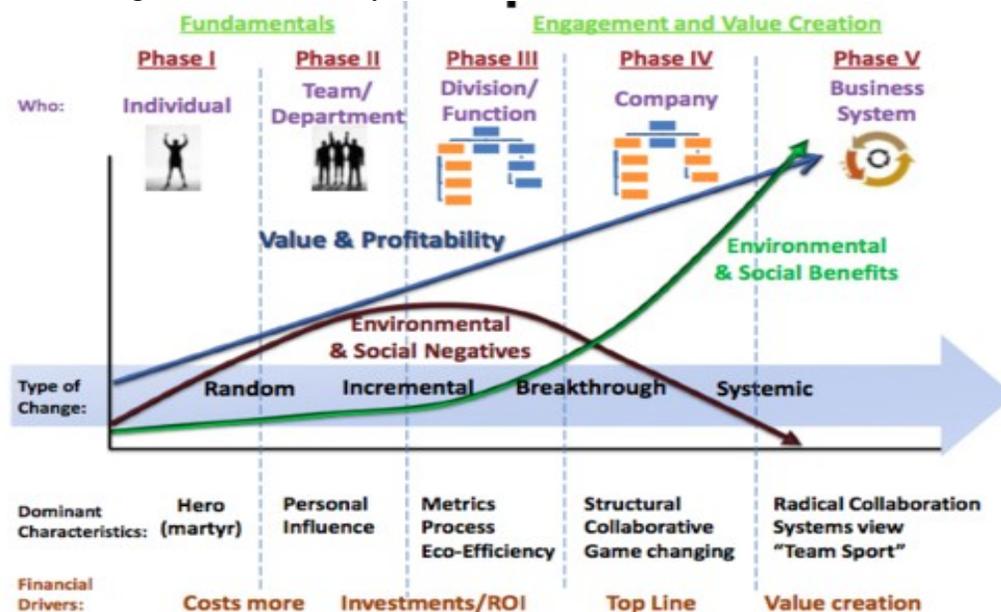


Fig. 1: Evolution of Organizational Value Creation toward Real-Time BI-Enabled Sustainable Business Expansion

In the context of this study, the figure reinforces the argument that sustainable



business expansion emerges when real-time, BI-enhanced product performance intelligence enables organizations to move beyond incremental improvements toward breakthrough and systemic outcomes that simultaneously enhance profitability and environmental and social performance (Fig. 1).. Fig. 1 illustrates the progressive evolution of organizational value creation across five phases, ranging from individual and departmental efforts to fully integrated business systems. The figure depicts how early-stage, fragmented decision-making is associated with incremental change, higher costs, and limited sustainability benefits, while advanced, system-level coordination enables breakthrough and systemic transformation. In line with this study, the upward trajectories of value and profitability alongside environmental and social benefits highlight the necessity of real-time BI-enabled product performance intelligence to support integrated decision-making. By aligning operational, product performance, and sustainability metrics across organizational levels, real-time analytics act as a critical enabler for achieving sustainable growth, strategic agility, and long-term competitive advantage.

1.1 Literature Review

1.1.1 Business Intelligence and Real-Time Analytics

Business Intelligence has passed from the stage where one would ease oneself with a conventional reporting tool reliant on historical data to that level which baulkingly levers distinct features on artificial intelligence and machine learning as well as real-time features (Mikalef *et al.*, 2020; Kristoffersen *et al.*, 2021). Earlier, BI was focused more on static reporting and descriptive analytics; now, developments are increased by the new BI trends that include predictive and prescriptive analytics through the technology of big data and AI application (Dubey *et al.*, 2019; Bag *et al.*, 2021). The introduction of cloud-based and streaming technologies further enables

instantaneous data processing, making an organization more agile by overcoming and giving strategic foresight in highly volatile environments (Appio *et al.*, 2021). Real-time analytics are now a must-have, allowing for continuous monitoring using data streams and engaging dashboards (Mikalef *et al.*, 2019). Such a context in product management includes dynamic adjustment by the real-time BI application mechanism to evolving market demands, optimization of the supply chain, and performance monitoring for each product life cycle (Kristoffersen *et al.*, 2020; Ademilua , 2021). Such advanced business intelligence tools utilize AI to facilitate scenario simulation and forecasting, which will straightaway determine the product strategy and innovation (Bag *et al.*, 2022; Dubey *et al.*, 2021). This enhancement strengthens BI's capacity to fuse different data sources and offer actionable intelligence in the face of competitive threats (Adeusi *et al.*, 2024; Appio *et al.*, 2021).

1.1.2 Product Performance Intelligence

The performance intelligence on products is therefore based on an elaborate set of Key Performance Indicators (KPIs) across the life cycle of a product, that is, from development to maturity and decline (Dolci *et al.*, 2024; Bag *et al.*, 2021). Some of the critical KPIs include financial measures like revenue growth and market share, operationally based such as defect rates and quality compliance, as well as user-centric measures like Net Promoter Score (NPS) and satisfaction (Kristoffersen *et al.*, 2020). These indicators facilitate the continuous evaluation of product viability, customer engagement, and aspects requiring iteration (Dubey *et al.*, 2019; Mikalef *et al.*, 2020). Customer Lifetime Values (CLTV) and time-to-market metrics are vital for assessing long-term profitability and flexibility for launching innovations, respectively (Adeyemi, 2024; Bag *et al.*, 2022).

Practically, dashboards employing BI will aggregate and visualize these KPIs so that data



may be considered in decisions related to trends in quality, feedback, and velocity (Dubey *et al.*, 2021). KPI frameworks are shaped by factors including regulatory parameters and industry standards, with specific focus on lifecycle phases (Ajibola Dada *et al.*, 2024). By integrating feedback loops and performing sentiment analysis, intelligent systems may further refine intelligence, facilitating proactive improvements (Mikalef *et al.*, 2019; Bag *et al.*, 2021).

1.1.3 Sustainability in Business Expansion

Sustainability has become increasingly important in the expansion of businesses, as Environmental, Social, and Governance strategy frames where the ethical and resilient growth ends (Bag *et al.*, 2021; Yang *et al.*, 2024). The ESG dimensions entail ecological footprints, societal impacts, and integrity of governance, with most correlating to improved financial outcomes and compliance (Kristoffersen *et al.*, 2020). The circular economy transformations convert the paradigm of expansion toward more recirculation and resource windfalls, waste reduction, and regenerative designs towards a linear consumption (Dolci *et al.*, 2024).

Models of growth embed in their sustainability circular principles under which innovations like extended producer responsibility are evoked to create avenues through which resources can be recovered (Baratta *et al.*, 2023; Omosunlade, 2024). Those organizations that implement these measures would have augmented their ESG scores, diverse revenues, and overhead costs compliance with standards, such as ecodesign (Appio *et al.*, 2021; Mikalef *et al.*, 2020). The interplay between ESG and the circular economy mitigates risks, builds trust, and offers opportunities for green financing (Bag *et al.*, 2022;.

1.1.4 Integration Gaps

Notwithstanding progress made, gaps remain in linking real-time BI with product

performance intelligence and sustainability requirements (Kristoffersen *et al.*, 2020; Bag *et al.*, 2021). BI systems are seldom extended to incorporate ESG datasets since there is a preponderance of focus on operational efficiencies and BI isotope glonass plays are presenting disintegrated views, preventing integrated planning (Dolci *et al.*, 2023; Dubey *et al.*, 2019). Roadblocks include a lack of coherence in data, lagging AI applications geared towards sustainability, and weak governance (Sanni 2024; Appio *et al.*, 2021). Real-time BI prioritizes the needs of immediate performance over the requirements of eternal sustainability, not making adequate provisions for circular metrics to be cluded in a product KPI (Bag *et al.*, 2022). Scholars advocate for frameworkы that are digitally enabled *вaспич*. However, obstacles-related dissimilar regulations, ability shortages-yet remain on the table-for the establishment of FRAMEWORKS DIGITAL-ENABLED (Kristoffersen *et al.*, 2021; Dubey *et al.*, 2021). Closing these gaps will be fundamentally important for realizing unified systems that will further their sustainable growth.

2.0 Conceptual Framework Development

This section proposes a conceptual framework titled Real-Time BI-Enhanced Product Performance Intelligence for Sustainable Business Expansion. The core premise of this framework is that real-time Business Intelligence (BI) acts as a critical enhancer between raw data on product performance and sustainability outcomes, which are to be focused on in driving long-term business expansion. Gaps in the literature, such as late insights, data silos, and insufficient integration of ESG metrics (Kristoffersen *et al.*, 2020; Dubey *et al.*, 2019), inform the synthesis of real-time analytics, product KPIs, and principles of circular economy into a sequential, iterative framework. It moves firms toward maximum visibility, more informed

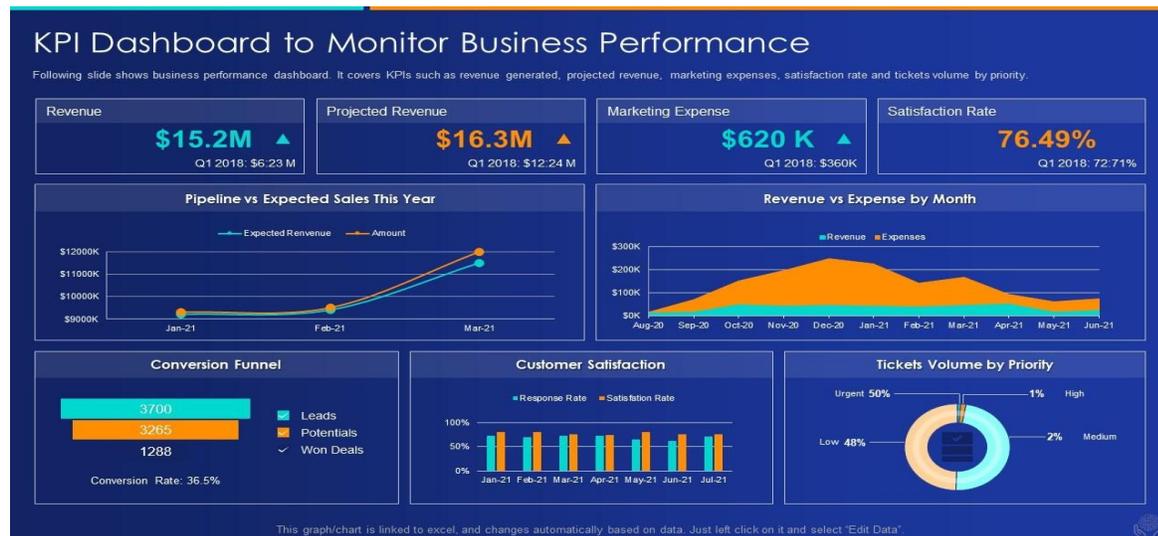


decision-making, and alignment to imperatives of sustainable growth using advanced BI tools for instantaneous processing (Appio *et al.*, 2021; Bag *et al.*, 2021).

Table 1: Key Constructs from Literature

Construct	Definition	Key References (pre-2025)	Role in Framework
Real-Time BI	Instant data processing for decision-making	Various BI evolution studies	Core enabler
Product Performance KPIs	Metrics like sales, quality, lifecycle	Product management literature	Input data layer
Sustainability Metrics	ESG scores, resource efficiency	Sustainability reporting frameworks	Outcome driver
Business Expansion	Growth via markets, innovation	Strategic management texts	Ultimate objective

****An overview of business intelligence technology (Chaudhuri, Dayal & Narasayya, 2011).**



****Key performance indicators: Developing, implementing, and using winning KPIs (Parmenter, 2015).**

Towards that end, this framework is designed to have a layered flow of directionality: Data Sources → Real-Time BI Processing → Performance Intelligence → Sustainability Alignment → Expansion Strategies. This sequential arrangement reflects how BI transforms disparate data into actionable intelligence having sustainability essence (Mikalef *et al.*, 2020). Implicit feedback loops can be iteratively conditioned to enter additional data streams into a system. This framework develops smart circular economy

strategies under existing models through digital technologies while integrating real-time BI explicitly into the product-specific application (Kristoffersen *et al.*, 2020).

The first part is the Data Sources, which captures types of extensive inputs including IoT sensors for production monitoring, sales databases, supply chain logs, platforms for customer feedback, and even ESG reporting systems (e.g., carbon-tracking tools) (Dubey *et al.*, 2019; Bag *et al.*, 2022). These sources provide endogenous, streaming data on product lifecycle stages, quality metrics, and



environmental impacts (Appio *et al.*, 2021). Next, Real-Time BI Processing is the enhancer, adopting stream processing, AI analytics, and dashboards to cleanse, integrate, and analyze data instantly (Mikalef *et al.*, 2019; Kristoffersen *et al.*, 2020). This layer closes the conventional time lag by using predictive modeling and anomaly detection, changing static reporting to dynamic insights (Dubey *et al.*, 2021; Bag *et al.*, 2021).

The processed data is tuned for Performance Intelligence, with it producing wide-ranging KPIs such as velocities at which products are sold, rates of defective sales, customer scores, and rates of use for resources (Dolci *et al.*, 2024). This intelligence gives visibility to product health throughout its life cycle (Appio *et al.*, 2021; Mikalef *et al.*, 2020). Sustainability Alignment is the next step, merging outputs with circular economy and ESG indicators, such as carbon footprint per unit, recyclability rates, and social impact scores (Kristoffersen *et al.*, 2020; Bag *et al.*, 2022). The performance metrics are then weighted against sustainability thresholds, steering decisions that avoid environmental harm while maximizing efficiencies (Dubey *et al.*, 2019).

Finally, Expansion Strategies emerge as outcomes: market penetration of products with eco-friendly characteristics, new designs circular-oriented, and scaling resilient supply chains (Bag *et al.*, 2021). This layer practically translates the aligned intelligence into actions strategically oriented towards sustainable growth (Mikalef *et al.*, 2020; Dubey *et al.*, 2021).

Proposition 1 (P1): Real-time BI processing significantly improves visibility of product performance through reduction of latency in data integration and analysis toward more accurate and timelier KPIs (Mikalef *et al.*,

2019; Dubey *et al.*, 2021; Kristoffersen *et al.*, 2020).

Proposition 2 (P2): The introduction of sustainability KPIs (sample: ESG and circular economy metrics) into BI-enhanced performance intelligence directly results in superior overall quality of decision-making by integrating profitability alongside the balancing of trade-offs between environmental/social impacts (Bag *et al.*, 2021; Appio *et al.*, 2021; Rosa *et al.*, 2022; Dubey *et al.*, 2019).

Proposition 3 (P3): Ultimate beneficiary of aligning the framework would be sustainable business expansion through growth that will stand the test of resilience, innovations in product offerings, and competitive advantage in regulated markets (Mikalef *et al.*, 2020; Bag *et al.*, 2022; Kristoffersen *et al.*, 2020).

These propositions make testable hypotheses for future empirical research while also laying theoretical groundwork regarding the integrative role of real-time BI into sustainability contexts (Dubey *et al.*, 2021). Business intelligence adoption for small and medium enterprises: Conceptual framework (Al-Sharif, Al-Qarni & Al-Hawamdeh, 2023). To complement the proposed real-time BI-enhanced product performance intelligence framework, Fig. 2 presents a theoretical model explaining the organizational and behavioral mechanisms that influence the adoption of Business Intelligence Systems (BIS). Drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM), the figure clarifies how information quality, social influences, and facilitating conditions shape user perceptions and ultimately determine BIS adoption outcomes within sustainability-driven organizations (Fig. 2).



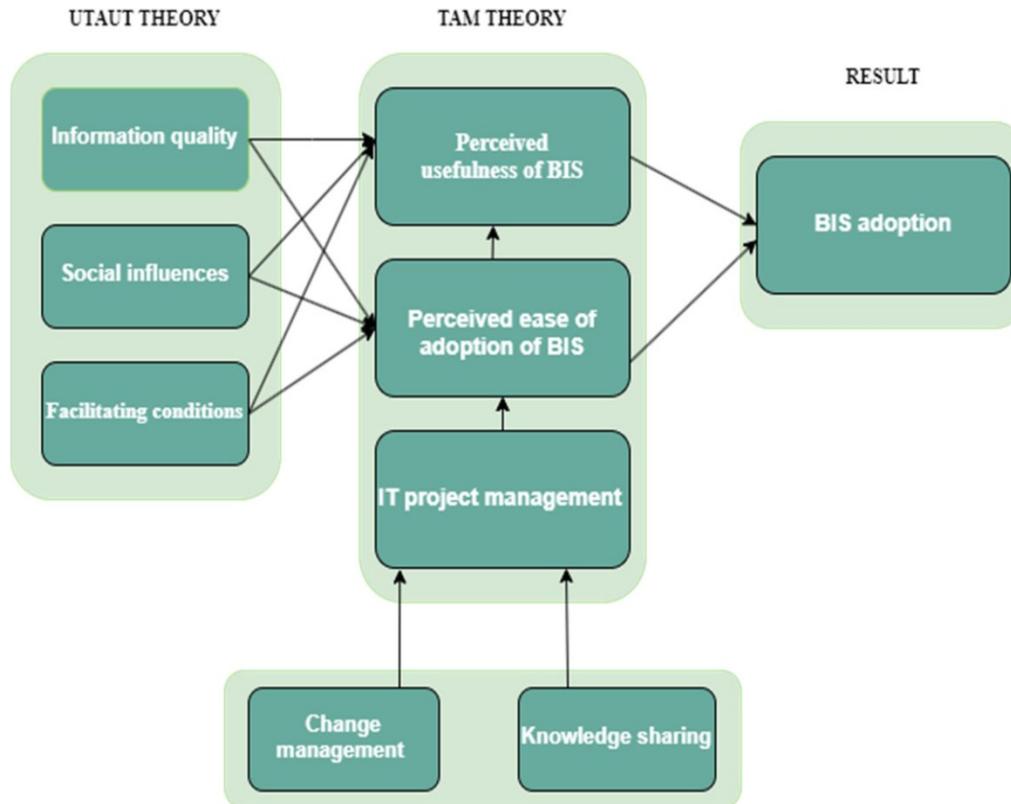


Fig. 2: Integrated UTAUT–TAM Model for Business Intelligence System Adoption in Sustainability-Driven Organizations

Fig. 2 depicts an integrated UTAUT–TAM framework illustrating the pathways leading to Business Intelligence System (BIS) adoption. The model shows how information quality, social influences, and facilitating conditions influence users’ perceived usefulness and perceived ease of adoption of BIS. These perceptions are further supported by effective IT project management, which is reinforced by change management practices and knowledge-

sharing mechanisms. In line with this study, the figure emphasizes that successful BIS adoption depends not only on technological capability but also on organizational readiness and human-centric factors. By strengthening these antecedents, organizations can enhance real-time analytics adoption, thereby enabling integrated product performance intelligence and sustainability-oriented decision-making.

Table 2: Framework Components and Links

Component	Description	Inputs	Outputs
Real-Time Data Layer	IoT, sales, supply chain feeds	Raw product data	Processed insights
BI Enhancement Sustainability Integration	Analytics, dashboards ESG weighting	KPIs Performance metrics	Intelligence reports Sustainable strategies
Expansion Outcomes	Market growth, innovation	Aligned decisions	Revenue/ESG improvement

****Framework Components and Links (Manavalan & Jayakrishna, 2019)**



3.0 Discussion and Implications

This framework bridges two advanced theoretical domains—business intelligence (BI) and sustainability theory—by integrating real-time BI into product performance intelligence. Traditionally, BI research has focused on operational efficiency and data-driven decision-making, whereas sustainability theories emphasize long-term environmental, social, and governance (ESG) impacts through circular economy principles (Kristoffersen *et al.*, 2020; Bag *et al.*, 2021).

This integration positions real-time BI as a mediating mechanism that embeds sustainability metrics into product performance intelligence, extending the resource-based view by demonstrating how digital capabilities can drive sustainable competitive advantage (Mikalef *et al.*, 2019; Dubey *et al.*, 2019). The framework illustrates how real-time analytics can support regenerative product management strategies aligned with smart circular economy principles (Bressanelli *et al.*, 2018).

The propositions further connect dynamic capabilities theory—where real-time processing enhances organizational agility—with sustainability-oriented innovation, responding to calls for interdisciplinary models that align Industry 4.0 technologies with ESG outcomes (Appio *et al.*, 2021; Bag *et al.*, 2022). The framework contributes to theory by providing a structured pathway from real-time data streams to sustainable business expansion, offering potential extensions to institutional theory in the context of regulatory compliance through BI (Dubey *et al.*, 2021; Kristoffersen *et al.*, 2021).

Functionally, the framework offers practical guidance for organizations seeking to implement real-time dashboards that integrate product performance and sustainability metrics. This involves identifying critical data sources (e.g., IoT for real-time production tracking and ESG reporting tools) and

deploying BI platforms such as Power BI or Tableau for stream processing and visualization. Dashboards should integrate KPIs such as sales velocity, carbon emissions per unit, and recyclability rates, enabling managers to monitor trade-offs between operational performance and sustainability outcomes (, 2022; Bag *et al.*, 2021).

Implementation steps include piloting the system with a single product line, training cross-functional teams in data interpretation, and iteratively refining processes using feedback loops. This approach enables informed decisions on redesigning products for circularity, promoting resilient solutions and enhancing stakeholder value beyond mere compliance with green market expectations (Dubey *et al.*, 2019; Appio *et al.*, 2021).

Several challenges must be addressed, with data privacy being paramount due to the sensitive nature of customer feedback, supply chain data, and ESG disclosures under regulations such as GDPR (Mikalef *et al.*, 2019; Kristoffersen *et al.*, 2020). Other barriers include integration costs, such as infrastructure upgrades, software licensing, and interoperability challenges (Dolci *et al.*, 2024). Additionally, implementing AI-driven BI and sustainability analytics is demanding, requiring specialized expertise, training, or external partnerships for successful deployment (Dubey *et al.*, 2021). Apart from that, the adoptions of AI-driven BI and sustainability analytics are challenging because most organizations do not have enough expertise in this area and will require heavy investment in training or partnerships with outside sources for successful implementation (Dubey *et al.*, 2021; , 2020).

Future research should empirically validate the propositions using quantitative methods, such as surveys or structural equation modeling, to examine causal relationships between real-time BI adoption and sustainability outcomes across different industries (Mikalef *et al.*, 2020;



Dubey *et al.*, 2021). Rich insights can also be obtained through case studies of organizations that have implemented real-time BI, as well as longitudinal and cross-regional comparative

studies to explore the moderating effects of regulation, industry, or organizational size (Kristoffersen *et al.*, 2021).

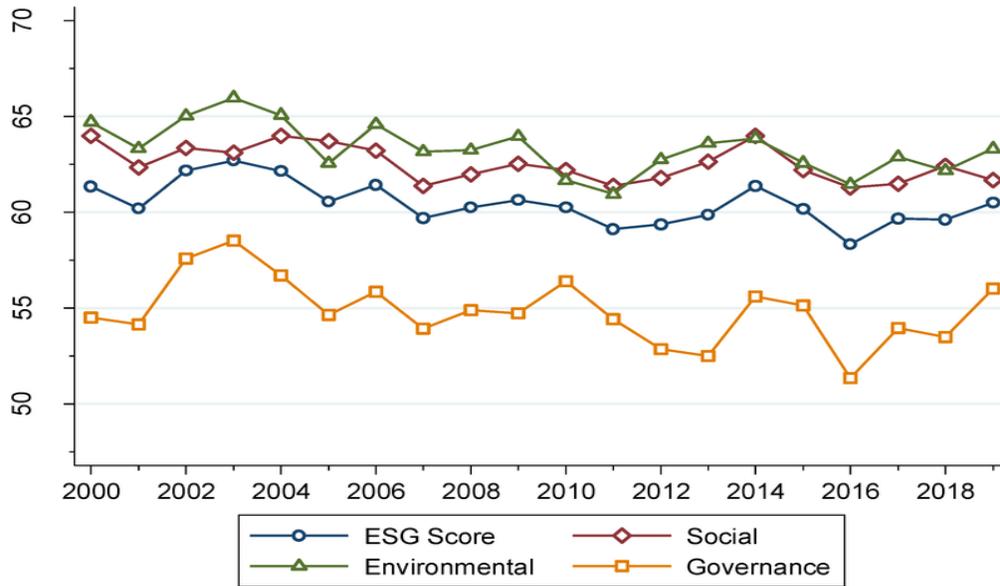


Fig. 2: ESG Impact Graph (Klau, 2009)

4.0 Conclusion

This conceptual paper provides a detailed description of a framework of Real-Time BI-Enhanced Product Performance Intelligence as a strong approach for achieving sustainable business growth. Under this framework, a detailed and process-centered methodology is established detailing the process from various sources of data like production sensors, sales, and environmental trackers to instant BI processing generating timely insights to build strong performance intelligence in alignment with sustainability objectives through circular and responsible metrics toward strategic actions for growth.

The principal contributions of the framework lie in bridging the two worlds of analytics and sustainability practices. It introduces the idea of how digital technology builds resilience in an organization by viewing real-time processing as a key link to creating green innovation. But perhaps more important is the practicability of the framework whereby it

provides step-by-step directions for making dashboards that blend product metrics with sustainability indicators, eventually helping to reduce such weaknesses as slow feedback and disconnected data systems.

The ultimate goal of real-time BI-enhanced product intelligence is sustainable growth by providing immediate clarity on product performance while ensuring that such performance is judged within environmental and social boundaries. This allows companies to quickly identify waste, enhance resource effectiveness, redevelop products for long life cycles, and access profit pools with confidence. In a world of tighter regulations and higher stakeholder expectations, such intelligence transforms problems into prospects, cultivating resilience and true growth.

Business leaders are encouraged to embrace this framework through small-scale experiments that demonstrate how real-time BI tools connect with product data and sustainability data. These tests will not only set a basis for compliance with ever-changing



standards but will also open the doors to innovative, green-centered expansion. Thus, it becomes important for both researchers and practitioners to continue refining and testing the model in applied contexts, as well as explore new technologies that could sharpen the predictions made with the model even further. Ultimately, adopting real-time BI-enhanced intelligence will help to enhance the future prospect of sustainable development in an increasingly resource-poor world.

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Authors' Contributions

Precious Mkpouto Akpan conceptualized the study, designed the framework, and drafted the manuscript. Adewunmi O. Wale-Akinrinde contributed to theoretical development, literature synthesis, and critical revisions. Toluwalase Damilola Osanyingbemi supported data interpretation, framework structuring, and editing. Oluwapelumi Adebukola Fadairo contributed to sustainability integration, discussion development, and final manuscript review, ensuring coherence, clarity, and alignment with sustainable business intelligence objectives globally overall.

