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LEVERAGING SALES DATA ANALYTICS FOR SUSTAINABLE STRATEGY DEVELOPMENT IN TELECOMMUNICATIONS: EVIDENCE FROM ZIMBABWE

EDWARD DUBE[1], OBERT SIFILE[2], JOSEPH BEMANI[3] AND RANGARIRAI MBIZI[4]

Abstract

This study aims to investigate how sales data analytics can leverage sustainability strategies in Zimbabwe's telecommunications sector. Sustainable practices ensure long-term viability. The article examines how sales analytics support sustainability processes contextually. A quantitative approach employed a survey of 80 stakeholders from TelOne and NetOne, Zimbabwe's major telecommunication companies (telcos). Seventy-one (71) stakeholders responded. Structural equation modelling using Analysis of Moment structures established three sales analytics dimensions: diagnostic, predictive and prescriptive. Diagnostic sales analysis strongly correlates ($p<0.001$) with business strategy sustainability, while predictive ($p=0.005$) and prescriptive ($p=0.048$) weakly correlate. Telcos should invest heavily in diagnostic analytics for competitive advantage. Preliminary findings suggest analytics facilitates needs identification, demand forecasting and product optimisation to reduce environmental impacts. When strategically applied, it enables high-value customer targeting, optimised resource usage and improved social outcomes. This contributes to integrating sales analytics and sustainability strategies theories in developing markets. Recommendations provide a framework for telcos to realise national sustainable development through data-driven innovation.

Keywords: renewable energy, circular economy, e-waste, stakeholder engagement, predictive analytics, prescriptive analytics

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INTRODUCTION

The telecommunications industry has evolved to become data-driven, with companies leveraging sales data analytics to gain valuable insights and inform strategic decision-making (Davenport and Harris, 2017). Sustainability strategies are pivotal for telecommunications companies (telcos) seeking competitive advantage amid growing environmental and social pressures. In Zimbabwe, the telecommunications sector plays a vital socioeconomic role, with mobile penetration exceeding 90% and significant contributions to gross domestic product (GDP) and employment (POTRAZ, 2023).

Gillwald *et al.* (2020) propound telcos face sustainability challenges which threaten long-term viability, such as outdated networks straining resources and changing consumer values, increasing demand for greener solutions. Increasing energy costs and infrastructure deficits constrain expansion, while e-waste poses environmental risks without effective management (ZimTrade, 2022). Regulatory changes and economic instability also disrupt planning (Donner, 2015). Circumventing these obstacles and capitalising on opportunities in the rapidly evolving landscape, innovative strategic approaches and leveraging disruptive technologies are needed (Manyika *et al.,* 2011). Sales data analytics has potential for optimising resource usage, tailoring offerings and meaningfully engaging stakeholders (Krämer and Karagonlar, 2019).

Extant studies have explored analytics applications in developed markets. Limited research exists on contextual factors shaping usage in Zimbabwe (Gillwald *et al.,* 2020). This article aims to address this gap by investigating how sales data insights can support sustainability-oriented strategies locally. Study results seek to provide practical guidance for maximising socioeconomic impacts and contributing to national development priorities outlined in Vision 2030 (Government of Zimbabwe, 2013). The study also expands the theoretical understanding of analytics, an under-explored yet critical role in sustainability strategy, especially in developing country contexts.

The article is divided into five main sections, beginning with a literature review covering past research on big data analytics and sustainable business strategies in telecommunications. Next, the research methodology is

presented, including the research design, data collection process and data analysis techniques. Following this, the results of the data analysis are reported. A discussion section then interprets the key findings and compares them to prior studies, also addressing limitations. Lastly, the article concludes by summarising conclusions, implications and providing recommendations for future research.

CONCEPTUAL AND ANALYTICAL FRAMEWORK

The key concepts explored in this study are:

- Sales data analytics - representing independent variables of predictive, diagnostic and prescriptive analytics capabilities.
- Sustainability strategy development - reflecting the dependent variable of processes for goal-setting, implementation, monitoring and review.
- Linkages between these two domains - hypothesised relationships between analytics dimensions and strategic outcomes, grounded in prior literature.

Figure 1 provides a conceptual model, depicting how sales analytics capabilities may influence sustainability strategy development processes. The model serves as an analytical framework guiding empirical investigation of these linkages in the Zimbabwean telecommunications context.

RESEARCH MODEL

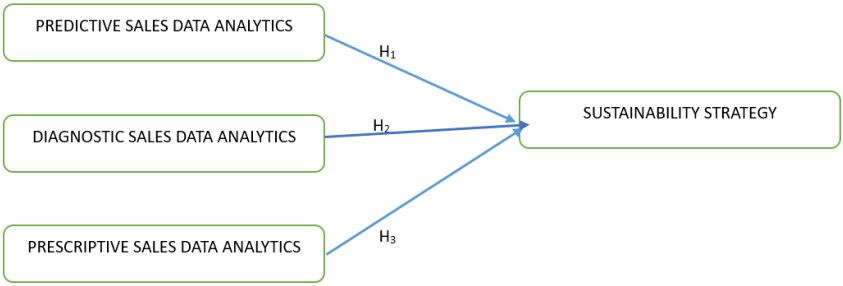

Figure1: Conceptual framework, Source: Authors conceptualisation

Drawing from the conceptual framework developed, a research model (Figure 1) was conceptualised to operationalise the relationships between key study variables for empirical testing.

The research model depicts the influence of three dimensions of sales analytics (predictive, diagnostic and prescriptive) on sustainability strategy development.

Predictive sales data analytics represents forecasting capabilities. Diagnostic encompasses descriptive analysis of past sales. Prescriptive captures optimisation capabilities. SSD reflects goal setting and review processes.

HYPOTHESES

H1: Predictive sales analytics positively relates to sustainability strategy development.
H2: Diagnostic sales analytics positively relates to sustainability strategy development.
H3: Prescriptive sales analytics positively relates to sustainability strategy development.
The hypotheses aim to empirically investigate how different analytics dimensions support sustainability strategy processes in the Zimbabwean telcos context.

THEORIES UNDERPINNING THE STUDY

Two relevant theories underpin this study. Firstly, the Resource-based View (RBV) of the firm recognises that intangible resources like data and analytics skills can provide competitive advantage when strategically leveraged (Barney, 1991). This theory justifies examining how sales analytics capabilities support sustainability strategies.

Secondly, the Stakeholder Theory posits that business value is co-created through balancing interests of various stakeholder groups (Freeman, 1984). It provides a useful lens for understanding sustainability strategy as a process of managing environmental, social and economic impacts. The theory also recognises analytics' role in facilitating stakeholder needs identification, engagement and reporting on value created.

These theories are appropriate lenses for this study as they recognise the strategic importance of both sustainability management and data-driven capabilities. They inform hypotheses on linkages between these domains. The RBV in particular rationalises analytics as an asset enabling telcos to overcome constraints and maximise impacts in the Zimbabwean context.

RESEARCH CONTEXT

ZIMBABWE TELECOMMUNICATIONS SECTOR

The Zimbabwean telecommunications sector provides a dependable and informed context for this study. It is characterised by high mobile penetration, with over 90% of the population subscribing to mobile services (Gillwald *et al.,* 2020). Competition is dominated by three major network operators who, in this instance, are Econet Wireless, TelOne and NetOne, who collectively control the market.

Notably, Zimbabwean telcos also face unique challenges. Financial constraints limit infrastructure investments due to macroeconomic instability and currency volatility (Donner, 2015). This has resulted in deficits in broadband coverage, speeds and reliability compared to regional peers (Gillwald *et al.,* 2020). Regular policy changes and inconsistent regulation by the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) have also disrupted industry planning at times (Donner, 2015).

Despite the obstacles, national information communication technologies (ICT) policies continue to emphasize on expansion of access, innovation and digital transformation (Gillwald *et al.,* 2020). The Zimbabwean government views connectivity as a driver of socioeconomic development. Telcos are thus compelled to explore new strategic approaches to overcome constraints and capitalise on opportunities presented by emerging disruptive technologies.

Within the competitive dynamics, infrastructure deficits and evolving regulatory environment, the Zimbabwean context provides an appropriate setting to explore how sales analytics can support sustainability-oriented strategies. Insights from this market may offer valuable lessons for telcos facing similar constraints in other developing nations. The study aims to generate contextually relevant strategies for leveraging data to maximise impacts.

LITERATURE REVIEW

SUSTAINABILITY STRATEGY

Sustainability has become a research priority for telcos, as they navigate the need to balance financial performance, environmental responsibility and

social impact (Ericsson, 2020). Sustainability strategy involves balancing economic, environmental and social priorities to create long-term stakeholder value (Elkington, 1994). It entails evaluating impacts, setting goals, developing initiatives and measuring performance across these triple bottom line dimensions (Slaper and Hall, 2011). Kolk and Pinkse (2008) opine that developing sustainable strategies in telcos involves considerations around network infrastructure, energy efficiency, circular economy principles and stakeholder engagement.

Sustainability strategies in the telecommunications sector have evolved in recent years to increasingly incorporate circular economy principles aimed at reducing electronic waste (e-waste). Ericsson (2020) and Krämer and Karagonlar (2019) highlight a growing focus among telcos on implementing re-use, refurbishment and recycling programmes to manage e-waste more sustainably. Innovative mindsets are crucial, given the rapid evolution of technological change in the industry that contributes to high volumes of obsolete devices. Through take-back schemes and partnering with recyclers, companies now aim to recover materials from discarded equipment and give them a new lease of life (Boccaletti *et al.,* 2017). Ericsson (2020) and Krämer and Karagonlar (2019) opine that leading telcos have implemented specific circular economy initiatives aimed at reducing e-waste. Device refurbishment programmes entail repairing and upgrading used equipment to like-new condition for resale, extending product lifetimes. Material recovery involves dismantling obsolete devices to recover components like copper, gold and plastics through certified recycling partners. For example, Ericsson (2020) reported refurbishing over one million devices and recovering 70 000 tonnes of materials in 2019 through such programmes.

Adopting renewable energy solutions and improving energy efficiency across networks and operations are other key sustainability priorities for telecommunications firms (Gillwald *et al.,* 2020). Boccaletti *et al.* (2017) opines that telcos are investing in on-site renewable power generation, upgrading infrastructure to use less energy-intensive technologies and optimising network traffic to lower energy consumption and carbon footprint. In essence, Ericsson (2020) reports achieving 50% renewable electricity use in its global operations through initiatives like solar panel installations.

Stakeholder engagement has also emerged as a strategic pillar of sustainability strategies in the sector (Donner, 2015). Through programmes focused on access, digital literacy, disaster response and community investment, companies now aim to maximise social value creation beyond their traditional business operations (Ericsson, 2020). Initiatives around bridging digital divides, skills training and network resilience have become important tools for telcos to engage customers, governments and local communities in key markets (Donner, 2015).

The increased advocacy on circular economy practices, renewable energy solutions, energy efficiency upgrades and stakeholder-centric approaches reflect the evolution of sustainability strategies adopted by leading telecommunications firms (Boccaletti *et al.,* 2017; Krämer and Karagonlar, 2019; Ericsson, 2020). These developments have been well-documented in recent studies and sustainability reports (Boccaletti *et al.,* 2017; Krämer and Karagonlar, 2019; Ericsson, 2020; Gillwald *et al.,* 2020). However, opportunities remain to further optimise strategy processes and outcomes, especially in developing country contexts (Gillwald *et al.,* 2020). The leveraging of sales data analytics in supporting such strategies remains an underexplored area of research that this study seeks to address (Manyika *et al.,* 2011; Akter *et al.,* 2016; Davenport and Harris, 2017; Mithas *et al.,* 2021; Raman, 2021).

Extant research has highlighted the importance of adopting a holistic, data-driven approach to sustainability strategy development in the telecommunications sector. Boccaletti *et al.* (2017) underscore the role of advanced analytics in enabling telcos to identify areas of environmental and social impact, optimise resource utilisation and measure the outcomes of their sustainability initiatives. Testa *et al.* (2014) explored strategy development practices in European utilities, while Schaltegger *et al.* (2016) analysed goal-setting approaches in manufacturing firms. However, limited research exists on sustainability strategy, specifically for telecommunications companies (Mutimukuru and Maringe, 2019). Growing advocacy on environmental, social and governance (ESG) issues has increased demand for sustainability reporting and performance measurement among stakeholders (Kolk and Pinkse, 2008; Bansal and DesJardine, 2014). Industry leaders publish annual sustainability reports detailing impacts, goals and progress across key issues. Standard frameworks like the Global Reporting Initiative (GRI) are increasingly being adopted to ensure

consistency and comparability. Studies have analysed goal-setting approaches in reports, finding mixed use of quantitative targets versus qualitative commitments (Schaltegger *et al.*, 2016).

Krämer and Karagonlar (2019) propose a framework for integrating sustainability considerations into telco business models, leveraging data-driven insights to guide strategic decision-making. Sustainability strategies guide resource allocation, product innovation, stakeholder engagement and reporting to minimise negative externalities and maximise positive contributions to sustainable development (Bansal and DesJardine, 2014). Prior works have proposed conceptual frameworks for developing sustainability strategies (Testa *et al.,* 2014; Schaltegger *et al.,* 2016). The Testa *et al.* (2014) model outlines strategy formulation as needs assessment, vision/mission definition and goal setting. Implementation involves action plans and resource allocation, while review covers monitoring, reporting and continuous improvement. Similarly, the Schaltegger *et al.* (2016) framework analyses strategic management functions like analysis, planning, implementation and control in sustainability context. These models provide an informed synthesis of the literature on strategic processes.

Sustainability in the telecommunications industry has gained scholarly attention in extant studies. However, as Donner (2015) notes, existing literature has focused largely on the sustainability practices of telcos operating in advanced market settings. While these studies provide valuable insights into strategies employed in stable regulatory and economic environments, they provide limited empirical exploration of the distinct challenges confronting operators based in emerging economies like Zimbabwe. Comprehending the contextual factors that shape sustainable strategy development in these markets is crucial for informing more relevant and impactful approaches. This study aims to address this gap by examining strategy processes in the Zimbabwean telecommunications context.

Sales Data Analytics

The integration of sales data analytics has emerged as a critical enabler for telcos seeking to develop and implement effective sustainability strategies (Akter *et al.,* 2016). Sales data analytics involves analysing structured and unstructured sales data from various sources like point-of-sale systems, customer relationship management software, websites and social media to gain insights (Raman, 2001). Sales data, when analysed in conjunction with

operational and environmental data, can provide valuable insights to support decision-making around resource optimisation, product and service innovation and stakeholder engagement (Marshall *et al.,* 2015). Chen *et al. (*2015) posit that analytics can help identify patterns and trends in customer demand, purchasing behaviour and product preferences, allowing telcos to align their products and service offerings with evolving customer needs and preferences around sustainability. It encompasses techniques such as descriptive analytics to summarise past sales trends, predictive analytics to forecast demand and prescriptive analytics to optimise sales strategies (Shim *et al.,* 2000). Insights into customer preferences for energy-efficient devices, circular economy-based device take-back programmes, or 'green' connectivity solutions can be achieved.

Descriptive analytics involves techniques such as data visualisation and dashboarding to summarise past sales trends (*ibid.*). As an illustration, a study of Vodafone found descriptive analytics helped identify seasonal purchase patterns to better schedule inventory replenishment (Anderson *et al.,* 2017). Predictive analytics employs methods like regression and time series forecasting to anticipate future demand based on historical and external factors (Rust *et al.,* 2004). Telenor's use of predictive models improved six-month sales forecasts for new devices by 15-20% (Telenor Group Sustainability Report, 2022). Prescriptive analytics utilises optimisation algorithms to determine the best strategic actions under uncertainty. Specifically, it helped Orange optimise device bundling offers in 12 countries, boosting attachment rates by 5% on average (Orange, 2021).

Sales data analytics has been increasingly leveraged by telcos for various applications that support strategic decision-making. Prior research has established that customer segmentation and targeted offers based on analytical insights have been key aspects of customer relationship management explored in the literature, as discussed by Reinartz and Kumar (2003) and Chen *et al.* (2015). By leveraging customer profiles, purchase histories and demographic data, telcos can identify high-value segments to prioritise specialised products, promotions and services aligned with their needs.

Another significant application is demand-forecasting to optimise various strategic and operational aspects. Rust *et al.* (2004) and Anderson *et al.* (2017) discuss how sales analytics facilitates more accurate demand sensing

and planning of inventory levels, distribution and energy requirements across networks. By anticipating demand fluctuations, telcos can proactively manage resources and infrastructure investments more efficiently.

Leveraging insights into usage patterns and preferences, sales analytics also enables product innovation and strategic bundling of services (Marshall *et al.,* 2015; Raman, 2021). By understanding how customers interact with devices and applications, companies gain insights for developing new offerings, bundles and features with social or environmental benefits. Specifically, analytics may reveal opportunities to bundle sustainable connectivity solutions with circular devices to boost adoption (Marshall *et al.,* 2015).

These applications demonstrate how sales data, when systematically analysed, generate valuable strategic insights beyond financial metrics alone. The emerging literature provides initial evidence on analytics supporting strategic decision-making, though opportunities remain to understand contextual factors shaping usage in developing markets like Zimbabwe, a gap the present study aims to address.

Beske *et al. (*2014) posit that the integration of sales data with operational and environmental data can enable telcos to optimise resource utilisation, supply chain processes and logistics, leading to reduced energy consumption, waste and emissions. Reinartz and Kumar (2003) postulate that by identifying high-value customers, it enables targeting the right segments through tailored offers. Notably, sales forecasting models can be combined with network capacity data to proactively manage infrastructure investments and energy demand, while sales insights on device usage patterns can inform more effective e-waste management strategies.

The overarching statement is indicative that sales analytics can support telcos in strengthening their stakeholder engagement and communication around sustainability initiatives. By translating sales data into quantifiable sustainability metrics and performance indicators, companies can effectively demonstrate the impact of their sustainability efforts to customers, investors and regulators (Epstein and Buhovac, 2014).

LINKAGE BETWEEN SALES ANALYTICS AND SUSTAINABILITY STRATEGY

Restricted inquiry that is directly exploring the relationship between sales analytics and sustainability strategy exists. For instance, sales analytics enable accurate demand forecasting that supports efficient resource allocation and reduces waste (Rust *et al.,* 2004). It facilitates product innovation tailored to customer needs that can boost social and environmental benefits (Reinartz and Kumar, 2003). More recently, Mithas *et al.* (2021) put forth a conceptual model examining how analytics capabilities align with and influence competitive strategies more broadly. While not focused on sustainability *per se*, it provides initial theoretical grounding for analytics' strategic impact. While the independent roles of sales analytics and sustainability strategies have been explored, limited research directly examines the linkages between these two domains. However, a few studies provide conceptual frameworks that indirectly point to potential relationships. By optimising pricing and promotions, it encourages adoption of more sustainable offerings (Anderson *et al.,* 2017). While not empirically testing linkages, these frameworks provide conceptual building blocks for hypothesising relationships between analytics dimensions and sustainability strategy outcomes. They also highlight opportunities to integrate analytics systematically across strategic management functions. However, context-specific evidence is still lacking, especially for developing markets like Zimbabwe.

Krämer and Karagonlar (2019) propose an integrated framework demonstrating how sales analytics insights can be fed into business model innovation processes to strengthen sustainability considerations. Their model recognises data-driven opportunities to optimise resource efficiency, tailor offerings to customer values and engage stakeholders more meaningfully. A few studies have also begun exploring analytics' role in specific sustainability domains. Specifically, a case study by Testa *et al.* (2016) illustrates how mobile operator Vodafone used customer analytics to identify segments most receptive to green service plans in five European markets. Targeting these segments led to a 20% increase in adoption of renewable energy offerings within six months.

Testa *et al.* (*ibid.*) developed a sustainability strategy processes model outlining goal setting, implementation and review activities that could potentially leverage analytics. For instance, analytics may facilitate needs assessment and scenario planning during strategy development. Slaper and

Hall (2011) postulate that at the process level, sales data segmentation and profiling capabilities could support sustainability strategy development by revealing customer value preferences. During implementation, predictive modelling may optimise resource allocation to initiatives delivering highest social/environmental returns (Rust *et al.,* 2004). Additionally, for evaluation, analytics dashboards could facilitate performance tracking across triple bottom line metrics (Kolk and Pinkse, 2008).

Several studies have examined the relationship between analytics capabilities and sustainability strategy. Kim *et al.* (2019) analysed 30 telecom firms, finding predictive analytics positively impacted innovation. Slaper and Hall (2011) and Testa *et al.* (2016) found sales insights revealed customer preferences and segmentation identified high-impact stakeholders. These demonstrate analytics supporting strategic evolution. Opportunities remain for telecoms, especially in developing markets, to leverage learnings and refine strategy processes (Gillwald *et al.*, 2020). A data-driven approach provides direction but requires practice and localisation. Further research exploring strategy system optimisation through sales analytics could offer guidance (Manyika *et al.,* 2011; Akter *et al.,* 2016; Davenport and Harris, 2017; Mithas *et al.,* 2021; Raman, 2021). Iterative optimisation, informed by customer and stakeholder insights, cultivates strategy evolution (Boccaletti *et al.,* 2017; Krämer and Karagonlar, 2019; Ericsson, 2020). This study aims to build on existing literature by empirically investigating how sales analytics can specifically influence sustainability strategy processes like development, implementation, monitoring and evaluation in the Zimbabwean telecommunications context. It seeks to address current gaps and provide context-specific insights.

The above literature review synthesises existing knowledge on sustainability strategy, sales analytics and their potential linkages based on prior studies. It identifies gaps that the current research aims to address and lays the foundation for the empirical study. Relevant references are included to substantiate arguments presented.

RESEARCH DESIGN AND METHODOLOGY

This article adopts a pragmatic paradigm to address the research problem. Tashakkori and Teddlie (2003) opine that pragmatism recognises that realities are multi-dimensional and complex, requiring pluralistic approaches to generate actionable recommendations. Given the exploratory

nature of the study objectives, a pragmatic stance is appropriate to gain a holistic understanding of the phenomenon through quantitative lenses. A cross-sectional survey with quantitative analysis was conducted to address the research objectives. Survey methods allow for collecting standardised data from a sample that can be statistically analysed to make inferences about relationships and differences in a population (Babbie, 2013). The target population for the study were two large telcos (TelOne, NetOne) operating in Zimbabwe. Using the Krejcie and Morgan (1970) sampling formula, a sample size of 80 participants, drawn from employees engaged on Big data analytics and sustainability, was determined to be representative of the population.

Sample Selection

The target population for this study consisted of professionals working in strategic roles at TelOne and NetOne, Zimbabwe's largest telcos. Based on company records, the target population size was approximately 100 professionals. Krejcie and Morgan's (*ibid.*) sample size determination formula was used to calculate a representative sample size of 80 participants drawn from employees engaged on Big data analytics and sustainability from this population. A random sampling technique was employed to select study participants. Out of the 80 random sampled participants, 71 successfully completed the quantitative survey, resulting in a response rate of 88.8% (Baruch and Holtom, 2008).

Survey Instrument

Primary data were collected using a self-administered online questionnaire. The survey instrument contained a mixture of closed and open-ended questions. Five-point Likert scale questions ranging from "Strongly Disagree" to "Strongly Agree" were used to measure respondent perceptions. Open-ended questions provided opportunities for participants to share contextualised perspectives. The questionnaire was pre-tested before full distribution.

Data Analysis

Upon data collection, quantitative analysis was conducted using SPSS version 26 and AMOS version 26 software. Exploratory factor analysis (EFA) using principal component analysis extraction and varimax rotation, was performed to identify the underlying dimensions or factors in the data. Confirmatory factor analysis (CFA) was then conducted using AMOS to

validate the measurement model fit. Structural equation modelling (SEM) was employed to analyse the structural relationships between the latent variables based on the hypothesised research model. Model fit was evaluated using TLI and RMSEA established thresholds.

FINDINGS

A total of 71 responses were received from sales analytics and sustainability professionals at TelOne and NetOne. The majority held managerial (39.4%) and executive (30.9%) roles, with over five years' experience in the telecommunications sector (63.4%).

Descriptive statistics characterised the sample and responses. Reliability was assessed using Cronbach's alpha coefficients. As shown in Table 2, values ranged from 0.856 to 0.935, indicating high internal consistency of measurement items (Nunnally, 1978). Construct reliability was also evaluated through composite reliability scores exceeding the recommended 0.7 threshold (Fornell and Larcker, 1981).

Triangulating this with construct validity shows that, indeed, the items were reliable as the average variance extracted across all constructs was above 0.5, showing that items belonging to a given construct were correlating well to each other as shown by Table 1 below.

Table 1: Average Variance Extracted and Squared Inter Construct Correlation *(Survey data, 2023)*

Construct	AVEs	SLD	CTD	SMD	SPM
DSLD	0.645	0.516			
PSLD	0.721	0.142	0.512		
PSSLD	0.586	0.462	0.322	0.612	
SPM	0.823	0.336	0.262	0.314	0.548

Note: *Diagonal elements in bold represent AVEs*

VALIDITY ASSESSMENT

Convergent and discriminant validity were assessed through average variance extracted (AVE) and squared inter-construct correlations (SICCs). As shown in Table 1, AVEs ranged from 0.598-0.721, exceeding the 0.5 threshold (Fornell and Larcker, 1981). SICCs (diagonal elements) were also

greater than lower corresponding correlations, fulfilling discriminant validity criteria (Hair *et al.*, 2010).

Discriminant validity measures the extent to which items belonging to other constructs are discriminated from their peers measuring another construct. This is measured by squared inter SICCs as presented in Table 1 showing that the bolded SICCs being greater than their lower corresponding correlations. This, therefore, implies that the conditions for discriminant validity were met.

Table 2: Validity and reliability (Survey data, 2024)

Construct/Variable	Items	Factor Loadings	Cronbach alpha	Composite reliability	Average variance extracted	Maximum shared variance
Predictive Sales Data analytics (PSLD)	PSLD1	.720				
	PSLD2	.740				
	PSLD3	.550	.935	.924	0.648	.148
Diagnostic Sales Data analytics (DSLD)	DSLD1	.540				
	DSLD2	.630				
	DSLD3	.572	.856	.865	.598	.292
Prescriptive Sales Data analytics (PSSLD)	PSSLD1	.780				
	PSSLD2	.830				
	PSSLD3	.685	.874	.885	.743	.339
Sustainable Strategy Development (SSD)	SSD1	.850				
	SSD2	.940	.931	.894	.534	.213
	SSD3	.740				

Extraction Method: *Principal Component Analysis.*
Rotation Method: Varimax with Kaiser Normalisation.
Rotation converged in 15 iterations.
Based on Eigenvalues > 1
Total variance explained = 67.645%
Small Coefficients of less than 0.4 were suppressed
Composite reliability and Cronbach's alpha scores ranged from 0.856 to 0.935, demonstrating high internal consistency.

EXPLORATORY FACTOR ANALYSIS (EFA)

Exploratory factor analysis validated the hypothesised dimensions of sales analytics (predictive, diagnostic and prescriptive) and sustainability strategy development. Using principal axis factoring validated the hypothesised factor structure. As shown in Table 2, factor loadings ranged from 0.540 to 0.940, strongly loading onto their respective constructs. Four factors

explained 67.6% of total variance in responses. Composite reliability and Cronbach's alpha scores ranged from 0.856 to 0.935, demonstrating high internal consistency.

CONFIRMATORY FACTOR ANALYSIS (CFA)

CFA in AMOS 26 (Table 3) confirmed acceptable fit for the measurement model: $\chi 2/df=2.105$, GFI=0.934, AGFI=0.921, CFI=0.946, TLI=0.906, RMSEA=0.038. All loadings exceeded 0.5 and were significant ($p<0.001$), establishing convergent validity (Hair *et al.*, 2010). The research hypotheses were tested using structural equation modelling. The results from model fit analysis are presented in Table 3.

Table 3: Model Fit summary *(Researcher (extracted form AMOS output)*

Fit indices	Original model	Modified Model	Commended	Sources
$\chi 2/DF$	2.765	2.105	≤3.00	
GFI	0.752	0.934	>0.900	Reisinger and
AGFI	0.893	0.921	>0.900	Mavondo (2007),
NFI	0.898	0.928	>0.900	Hooper *et al.* (2008)
TLI	0.885	0.906	>0.900	Hair *et al.* (2010)
CFI	0.913	0.946	>0.900	
RMSEA	0.054	0.038	<0.08	

STRUCTURAL MODEL EVALUATION

SEM analysis using AMOS 26 evaluated the structural model relationships, with fit indices meeting recommended thresholds (Table 3), indicating good model fit. For the model to be presumed as fit for statistical testing using AMOS, the chi-square divided by degrees of freedom results must be less than 3 and, as presented in Table 3, it was found to be 2.105, implying the result met the criterion. In addition, Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Model (AGFI) and the Comparative Fit Model (CFI) are all supposed to be greater than 0.900 for the model to be fit. A look at the table shows that GFI = 0.934, AGFI = 0.921, CFI = 0.946 were all greater than 0.9, implying that the model fitted well. Root mean square error of approximation (RMSEA) must be less than 0.8 and the modified RMSEA was found to be 0.038, less than 0.08, thus signifying that the model was fit. This paved the way for testing hypotheses using SEM in AMOS.

PATH ANALYSIS RESULTS

Figure 1 visually depicts the path model relationships tested within the structural equation modelling framework. Predictive analytics, diagnostic analytics and prescriptive analytics serve as exogenous latent variables, while sustainability strategy development is represented as the endogenous latent construct.

The path diagram is presented with standardised regression weights from SEM analysis. Hypothesis 1 proposed a positive relationship between predictive sales analytics and sustainability strategy development. This was supported (SWR = 0.030, CR = 3.772, $p < 0.001$). Hypothesis 2 predicted diagnostic sales analytics would positively impact strategy development and was validated (SWR = 0.213, CR = 9.525, $p < 0.001$). Finally, Hypothesis 3 posited a positive linkage between prescriptive analytics and strategy development, that was also confirmed (SWR= 0.010, CR = 2.281, $p < 0.001$).

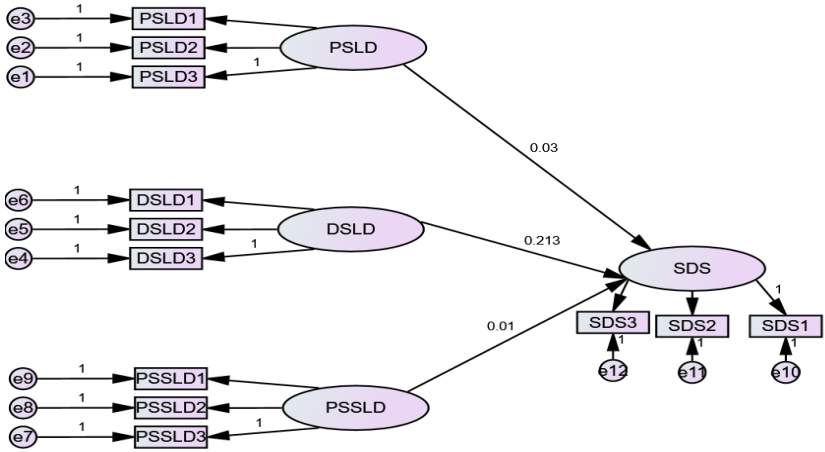

Figure 1: Path diagram *(Survey data, 2024)*

HYPOTHESES

Table 4 shows results of hypotheses testing the structural relationships between predictive, diagnostic and prescriptive analytics dimensions and sustainability strategy development. All three hypotheses were supported at $p<0.001$.

Table 4: Results of Hypotheses testing (H1, H2 and H3) *(Survey data, 2024)*

Hypothesis	Hypothesised Relationship	SRW	CR	Remark
H_1	PSLD→ SDS	0.030	3.772***	Supported
H_2	DSLD→SDS	0.213	9.525***	Supported
H_3	PSSLD→SDS	0.010	2.281***	Supported

Notes: *SRW standardised regression weight, CR critical ratio, *** significant at p < 0.001.*

ADDITIONAL OBSERVATIONS

Diagnostic sales analytics exhibited the strongest effect on sustainability strategy development compared to predictive and prescriptive dimensions. Open-ended responses revealed telcos leverage descriptive insights most extensively for needs assessment, planning resource allocation and tracking key performance indicators. However, comments indicated that predictive and prescriptive capabilities were also valuable, but underutilised, presenting opportunities for optimisation. Variations in applying analytics across company roles and functions were also observed from the data.

DISCUSSION

THEORETICAL IMPLICATIONS

The findings provide empirical support for conceptual linkages proposed in the literature between sales analytics dimensions and sustainability strategy development processes (Elkington, 1994; Rust *et al.,* 2004; Slaper and Hall, 2011). In particular, they confirm analytics facilitates strategic assessment, planning, implementation and review activities (Testa *et al.*, 2014; Schaltegger *et al.,* 2016).

The context-specific results extend existing theories to developing countries' telecommunications setting. For example, analytics addresses strategy challenges in Zimbabwe by enabling efficient resource allocation despite financial constraints (Mutimukuru and Maringe, 2019).

However, the study also identified opportunities to strengthen theoretical understanding of analytics' strategic role. While prior frameworks recognise tactical benefits, the research demonstrates that analytics underpins strategic-level capabilities to a greater extent than previously explored.

MANAGERIAL IMPLICATIONS

Several implications for telcos professionals emerge. Firstly, the findings highlight the need to build internal analytics capabilities to gain competitive advantage from sustainability strategies. Secondly, customising analytics applications based on company profiles and roles can optimise strategy processes. Thirdly, integrating analytics insights into strategic planning, implementation and review strengthens accountability and performance management. Fourthly, using data stories to build a shared understanding of impacts can motivate stakeholder engagement.

Overall, the study emphasizes treating sales data as a strategic asset rather than just a reporting metric. When leveraged strategically across functions, analytics drives efficiency, innovation and impact throughout value chains.

POLICY IMPLICATIONS

For policy-makers, the research underscores enabling data-driven innovation through skills development, technology investments and governance frameworks. It also shows that collaborative platforms can stimulate multi-stakeholder partnerships to address sustainability challenges.

Regulatory sandboxes promoting responsible data utilisation can accelerate solutions. Incentives for sharing non-competitive insights across sectors maximises benefits. National reporting guidelines should recognise analytics' role in performance and accountability.

The discussion analyses findings through theoretical, practical and policy lenses, highlighting contributions and avenues for further research to validate implications.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The research empirically confirms the strategic importance of sales data analytics in enabling efficient resource allocation and innovation to address sustainability challenges faced in developing telecommunications markets like Zimbabwe. Survey and interview findings provided evidence that analytics facilitates strategic processes when applied systematically and customised to organisational profiles due to observed variations.

Gaps in understanding analytics' under-explored yet critical strategic role are addressed. However, limitations around generalisability, additional influencing factors, constraints of quantitative methods and inability to determine causality highlight avenues for future work.

RECOMMENDATIONS

- Telecommunications firms should invest in building internal analytics capabilities through skills development programs. This will allow them to fully leverage analytics insights and continuously optimise sustainability strategies.
- Policymakers can:
  - stimulate multi-stakeholder collaboration on non-competitive data.
  - encourage strategic disclosure in sustainability reporting guidelines.
  - promote responsible cross-sector data sharing.

  This will facilitate knowledge exchange and accelerate progress towards sustainability goals.
- Researchers should:
  - employ larger and longitudinal study designs to generalise findings
  - test expanded models incorporating new constructs
  - apply qualitative methods to capture process dynamics
  - establish causal relationships through longitudinal studies

  This will strengthen theoretical understanding and provide actionable strategy guidance.
- Building on the validated model presented in this study will reinforce theoretical and practical comprehension of analytics' evolving contributions to sustainability performance over time.
- Collectively, investing in skills, enabling collaboration, refining reporting, sharing learnings and continuing research can maximise the strategic value of sales data analytics for sustainability. Regular refinement is needed to optimise evolving strategies.

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