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# DIGITAL FOOTPRINT: MODELLING PATHWAYS BETWEEN CUSTOMER DATA, STRATEGIC INSIGHTS AND SUSTAINABILITY PERFORMANCE IN ZIMBABWE'S TELECOMMUNICATIONS SECTOR

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

## Abstract

This study examines relationships between customer data analytics (CDA) dimensions and sustainability strategy development (SSD) in Zimbabwe's telecommunications sector. A survey of 71 stakeholders from two major telecommunications companies (telcos measured perceptions of five CDA dimensions: customer acquisition, satisfaction, retention, lifetime value and engagement analytics. Structural equation modelling evaluated the influence of these CDA dimensions on SSD. Results indicate customer acquisition and engagement analytics positively influences SSD (standardised regression weights of 0.213 and 0.214, $p<0.001$), while retention analytics shows a negative relationship (standardised regression weight of -0.122, $p<0.001$). Model fit indices confirmed these results. Original contributions provide initial empirical evidence advancing conceptual linkages between strategically applying CDA and formulating SSD. Findings demonstrate how CDA supports resource allocation for SSD. A path diagram depicts significant relationships between CDA dimensions and SSD. This study advances theoretical understanding of leveraging customer insights for sustainability strategies in developing country contexts.

**Keywords:** Descriptive analytics, diagnostic analytics, structural equation modelling, survey, interviews, cross-sectional

## INTRODUCTION

Sustainability strategies are pivotal for the long-term viability of telecommunications companies (telcos) given the growing environmental

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and social pressures they encounter (Dias *et al.*, 2017). Berrone *et al.* (2021) posit that emerging digital technologies present opportunities to enhance the processes used to develop sustainability strategies through insights derived from vast amounts of customer data. This study envisages to provide empirical evidence on how strategically leveraging customer data analytics (CDA) can support the development, implementation, monitoring and evaluation of sustainability strategies within Zimbabwe's telcos.

CDA involves collecting, analysing and using customer data to generate useful business insights (Raman, 2021). Telcos acquire large volumes of customer data through digital platforms which can potentially be harnessed to provide strategic value when developing sustainability strategies (Mithas *et al.,* 2021). Extant research has indicated CDA assists with demand forecasting, product development and customer segmentation (Fan and Ku, 2010; Trainor *et al.,* 2014). Nonetheless, limited empirical studies have analysed the role of CDA in sustainability strategies, particularly within developing country contexts (Berrone *et al.*, 2021).

Zimbabwe presents a conducive setting for examining this gap, given that the country faces sustainability challenges from rapid network expansion. At the same time, mobile penetration exceeds 90%, with telcos investing heavily in data analytics capabilities (POTRAZ, 2021; 2022). This provides an opportunity to understand how strategically leveraging CDA can aid sustainability processes. Sustainability issues involve high energy use, electronic waste generation and pressure to boost access for underserved communities (POTRAZ, 2021). This study aims to address gaps in the literature by providing initial quantitative evidence on relationships between CDA dimensions and sustainability strategy development (SSD) within Zimbabwe's telecommunications sector. The next sections describe the research context, literature review, research methodology, present the results of the study, discuss key findings and conclude with implications.

## CONCEPTUAL AND ANALYTICAL FRAMEWORK

This study examines the relationships between CDA capabilities and SSD processes in Zimbabwe's telecommunications sector. It is framed around three key concepts derived from the literature: customer data analytics capabilities, sustainability strategy development and shared value creation.

CDA involves collecting, analysing and leveraging customer data to generate strategic insights (Raman, 2021). Prior research links analytics capabilities to competitive advantage and resource optimisation when applied strategically (Mithas *et al.*, 2021). This study focuses on five core dimensions of customer analytics capabilities that telcos routinely analyze: customer acquisition, satisfaction, retention, lifetime value and engagement analytics. These metrics were identified through an extensive literature review as particularly salient for gaining customer understanding.

SSD refers to the processes of planning, implementing and monitoring strategies to address environmental and social issues faced by organisations (Berrone *et al.,* 2021). The literature conceptualises linkages between analytics insights and facilitation of sustainability strategy formulation and execution.

Shared value posits that insights revealing opportunities to balance economic, social and environmental priorities can simultaneously benefit firms and communities (Porter and Kramer, 2006). This concept underpins the proposition that customer analytics may facilitate sustainability strategies generating shared societal and business value.

## RESEACH MODEL AND HYPOTHESIS

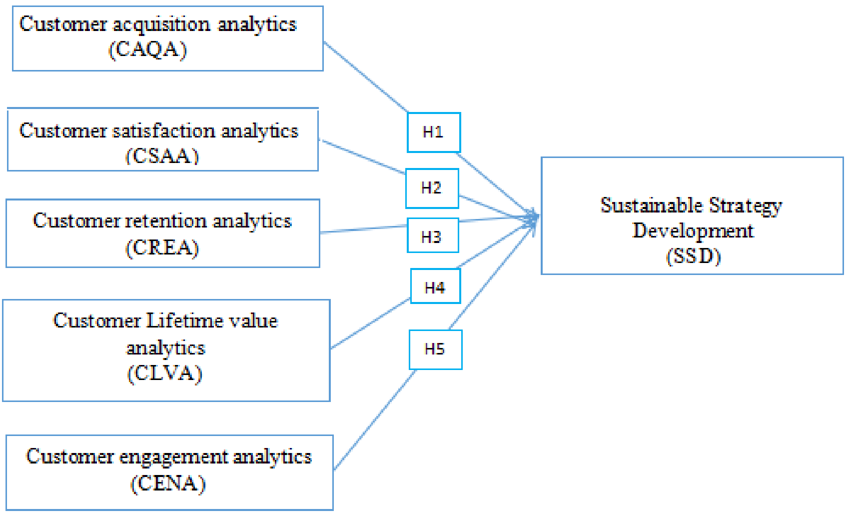


**Figure1:** Conceptual framework (Survey, 2024)

The analytical framework hypothesises that the five dimensions of customer analytics capabilities, as independent variables, will positively relate to the dependent variable of SSD. These relationships are grounded in a resource-based view theory, which proposes that rare, valuable and inimitable internal resources and capabilities can optimise resource allocation (Barney, 1991; Hart, 1995). The shared value perspective also informs the framework by conceptualising how analytics insights may balance priorities over the long term.

A diagrammatic representation of the conceptual framework (Figure 1) visually depicts the hypothesised directional relationships tested through this study. This analytical approach aims to empirically examine conceptual linkages between leveraging customer insights strategically and sustainability strategy processes.

## THEORIES UNDERPINNING THE STUDY

This study is guided by two primary theories. First, the resource-based view (RBV) proposes that rare, valuable and inimitable internal resources and capabilities can generate competitive advantage (Barney, 1991). Customer analytics skills provide unique customer insights over time, fitting this criteria (Mithas *et al.,* 2021). Mithas *et al.* (*ibid.*) conducted a meta-analysis of 82 studies and found that customer analytics capabilities were positively associated with competitive advantages through optimised resource deployment, supporting the notion that such capabilities fit the criteria for generating competitive advantage according to the RBV. RBV serves as a useful lens for hypothesising how analytics optimises resource allocation to support sustainability strategy processes.

Additionally, Shared Value Theory posits that sustainability strategies addressing social issues can simultaneously create economic value through core business decision-making (Porter and Kramer, 2006). This theory justifies hypothesising analytics may reveal opportunities balancing economic, social and environmental priorities in Zimbabwe's telecommunications sector, which faces challenges providing affordable, universal access while mitigating environmental impacts. Berrone *et al.* (2021) surveyed 164 firms across industries and found, through quantitative analysis, that environmental regulations were positively correlated with compensation incentives structured to promote innovation addressing social and environmental issues faced by firms and communities, supporting the conceptual proposition of Shared Value Theory.

Combined, these theories provide a strong conceptual basis for empirically testing hypothesised relationships between leveraging customer insights and sustainability strategies. The RBV suggests analytics optimises resource use for competitive differentiation, while shared value conceptualises balancing priorities. Both perspectives lend validity to examining whether analytics capabilities facilitate SSD that generates shared societal and business value over the long term.

## RESEARCH CONTEXT

Zimbabwe presents a compelling setting for this research, given the country's push to expand digital access to the marginalised regions and the associated sustainability challenges emerging in tandem with telecommunications growth. Mobile penetration has surged from under 10% in 2000 to over 90% to date, driven by investment and competition among the major operators, Econet Wireless, NetOne and Telecel (POTRAZ, 2022). This rapid expansion has delivered significant socioeconomic benefits by facilitating connectivity in both urban and rural areas. Mobile technologies now underpin commerce, education, healthcare and public services across Zimbabwe. Citizens have been major beneficiaries since affordability has improved through competitive pricing and inclusive bundled offerings (POTRAZ, 2021).

Notably, network expansion has also introduced sustainability pressures, threatening long-term viability if left unaddressed. Rising energy consumption from base stations and transmission towers places additional strain on Zimbabwe's electricity grid, which already faces reliability issues from aging infrastructure and periodic shortages (ZERA, 2020). Telcos still rely on diesel generators during outages to maintain service quality, contributing to both costs and carbon emissions. Expanding 4G/LTE and eventual 5G networks will further increase energy demands, unless optimised through strategies like infrastructure sharing and renewable integration (ZERA, 2021).

Electronic waste (e-waste) generation is another growing concern due to high device obsolescence and limited formal recycling infrastructure. Disposed electronics gadgets contain hazardous materials like lead, cadmium and mercury, which when improperly disposed, can leach into soil and waterways, posing health risks (Mudavanhu *et al.,* 2021). Zimbabwe generates an estimated 15 000 metric tons of e-waste annually, comprising 0.5% of global volumes, projected to double by 2030 without interventions (ZERA, 2021). Current disposal methods, like landfilling and informal recycling, expose scavengers to toxins with negative consequences (Mudavanhu *et al.,* 2021).

There is also pressure to boost connectivity in under-served rural communities which are more costly to service due to low population densities and infrastructure challenges (POTRAZ, 2022). Notably, leveraging customer insights through advanced analytics may reveal innovative, lower-cost access solutions tailored to local needs and contexts.

At the same time, Zimbabwean telcos have invested heavily in data analytics capabilities to optimise operations and customer experience. Both NetOne and TelOne employ dedicated analytics teams conducting research to extract insights from vast customer databases. However, limited studies have examined how strategically insights could support processes like sustainability planning.

Considering these dynamics, Zimbabwe provides a meaningful context to explore relationships between CDA and SSD empirically. Insights from this research have implications for addressing real challenges faced across the country's digital economy as networks expand and usage grows exponentially.

## LITERATURE REVIEW

Several preliminary studies propagated conceptual frameworks examining strategic resource use. Hart (1995) opines that capabilities reinforce environmental differentiation. Porter and Kramer (2006) postulate that conceptualised shared value creation through social issue insights. The RBV and shared value concept used in this study have been broadly employed in analytics and sustainability studies. In relation to the RBV (Hart, 1995), Mithas *et al.* (2021) administered a meta-analysis finding customer analytics capabilities positively correlated with competitive advantage through optimised resource deployment. They contend this stems from analytics' ability to reveal hidden resource potentials.

The RBV hypothesises that firms can achieve competitive advantage by acquiring and leveraging internal resources and capabilities that are rare valuable, imperfectly imitable and non-substitutable (Barney, 1991). Mithas *et al (*2021) opine that customer analytics capabilities fit these criteria by providing unique insights into customer needs, behaviours and value perceptions over time. Raman (2021) propounds that when strategically applied, such capabilities support innovation and process optimisation aligned with sustainability objectives. However, experimental validation of these linkages is still ongoing.

Porter and Kramer (2006) share that value concept have also seen experiential scrutiny. Shared value are policies and operating procedures that buttress the competitiveness of a company while simultaneously advancing the economic and social matrix associated with the communities in which it operates (Porter and Kramer, 2006). Berrone *et al.* (2021) conducted a survey of 164 firms across multiple industries. Through quantitative analysis of the survey responses, the study found out that environmental regulations were positively correlated with compensation incentives structured in a manner to promote innovation aimed at addressing social and environmental issues faced by the firms and their surrounding communities. This empirical finding supported the conceptual proposition put forth in prior studies (Porter and Kramer, 2006) that sustainability strategies integrating social impacts into business decision-making have the potential to simultaneously create economic value for firms.

Experiential studies have analysed analytics' role in processes like demand forecasting, which employs customer acquisition and satisfaction data (Fan and Ku, 2010). An empirical study by Fan and Ku (*ibid.*) quantitatively demonstrates that leveraging customer acquisition and satisfaction metrics derived from analytics, improved the predictive accuracy of sales projections for technology firms compared to non-integrated models. Through quantitative analysis of new product outcomes, Trainor *et al.* (2014) discovered that integrating insights into customer profitability generated through lifetime value analytics, led to optimised design configurations that enhanced financial performance.

Dias *et al.* (2017) propound an engagement framework categorising usage levels based on engagement metrics. A study carried out on Brazilian banks by Dias *et al.* (*ibid.*) reports weak associations between engagement analytics and green initiatives. Nonetheless, engagement is just one dimension of customer analytics and contextual factors may have influenced results. Generally, empirical tests of relationships between the full spectrum of analytics capabilities and sustainability strategies are still emerging.

Recent scholarship has linked analytics to sustainability outcomes through avenues like resource optimisation and innovation (Mithas *et al.,* 2021; Raman, 2021). Mithas *et al.*'s (2010) meta-analysis demonstrates a positive relationship between analytics maturity and competitive advantages. Raman (2021) interviewed European utility executives, observing analytics facilitated demand-side management programmes reducing carbon footprints. Berrone *et al.* (2021, 2022) analysed segmentation strategies using retention analytics in South African firms.

Notably, most studies have focused on developed country contexts, where data and analytical capabilities are more advanced. Limited research has applied such frameworks in African contexts, where sustainability challenges are particularly pressing, yet data remains a binding constraint. Berrone *et al.* (2022) qualitatively studied 13 South African firms, observing analytics supported resource circulation strategies aligning with social priorities when data quality permitted.

Comparative research highlights the need to consider contextual contingencies shaping value realisation from analytics. Regulatory environments, technological maturity levels and stakeholder pressures likely influence strategic impact (Mithas *et al.,* 2021). Comparisons thus enrich theoretical understanding by revealing how these factors moderate relationships. However, empirical tests specifically examining sustainability strategy processes in African telecommunications are still nascent.

This study aims to address several gaps. It brings empirical evidence to bear on unanswered questions in a developing country context with unique sustainability imperatives. Metrics like acquisition, satisfaction, retention and engagement, are leveraged to understand impacts. The RBV and shared value concepts provide theoretical lenses. A robust methodology controls contextual influences. Findings have implications for both literature and practice.

## RESEARCH DESIGN AND METHODOLOGY

A cross-sectional survey design was employed based on a pragmatic philosophy aiming to provide practical insights for industry and policy (Patton, 2015). A questionnaire was developed through an extensive process, incorporating feedback from experts. The final questionnaire, containing 17 items measured on a 5-point Likert scale, was developed. Five items tapped customer acquisition analytics, three each for satisfaction, retention, lifetime value and engagement analytics. Three items assessed SSD perceptions. The target population of 100 included analytics and sustainability professionals at Zimbabwe's two mobile operators, NetOne and TelOne. Using stratified random sampling, participants were selected in proportion to staffing levels at each firm to control potential organisational influences. Sample size was determined using Krejcie and Morgan's table (1970) to achieve a minimum of 80 responses, ensuring generalisability at a 95% confidence level. Invitations were distributed electronically through liaison officers, with reminders sent bi-weekly. A final sample of 71 responses was achieved, exceeding the minimum threshold.

Demographic data on role, experience, gender and education level were collected to control potential confounding. Responses were anonymised to minimise social desirability bias. Data collection spanned January-March 2024 to limit temporal influences on perceptions. Data cleaning involved screening for missing or inconsistent responses which were removed listwise. Composite scores were calculated as averages of item ratings. Descriptive statistics characterised perceptions and internal consistency was assessed through Cronbach's alpha. Relationships were examined through Pearson's correlations and cross-tabulations controlling demographic effects. SEM validated the hypothesised model using AMOS 26, with fit assessed by CMIN/DF, CFI, TLI and RMSEA. Convergent validity was confirmed through AVE, CR and factor loadings. While providing valuable initial insights, limitations must be acknowledged. The cross-sectional design precluded causal claims. Generalisability may be limited by the country context. Future research could employ longitudinal, experimental or mixed methods designs to address these limitations. However, this methodology generated robust, quantifiable evidence to meet research objectives.

## FINDINGS

### VALIDITY AND RELIABILITY

**Table 1:** Construct, Items and Factor loadings, Cronbach Alpha, Composite Reliability & AVEs *(Survey data, 2024)*

| Construct/ Variable | Items | Factor Loadings | Cronbach Alpha | Composite reliability | Average variance extracted | Maximum shared variance |
|---|---|---|---|---|---|---|
| Customer Acquisition Analytics (CAQA) | CAQA 1<br>CAQA 2<br>CAQA 3 | .714<br>.732<br>.660 | 0.935 | 0.924 | .0.648 | 0.148 |
| Customers Satisfaction Analytics (CSAA) | CSAA 1<br>CSAA 2<br>CSAA 3 | .640<br>.670<br>.772 | 0.856 | 0.865 | 0.598 | 0.292 |
| Customer lifetime value Analytics (CLVA) | CLVA 1<br>CLVA 2<br>CLVA 3 | .768<br>.822<br>.675 | 0.874 | 0.885 | 0.745 | 0.339 |
| Customer Engagement Analytics(CENA | CENA 1<br>CENA 2<br>CENA 3 | .652<br>.630<br>.781 | 0.868 | 0.842 | 0.665 | 0.154 |
| Customer Retention Analytics (CREA) | CREA 1<br>CREA 2<br>CREA 3 | .740<br>.613<br>.788 | 0.836 | 0.842 | 0.611 | 0.314 |
| Sustainable strategy Development (SSD) | SSD1<br>SSD2<br>SSD3 | .855<br>.966<br>.784 | 0.931 | 0.894 | 0.534 | 0.213 |

***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*

Almost a third (67.645%) of the variation was fully explained and rotation converged in 10 iterations, as Table 1 demonstrates. The reported total variation exceeded the permitted minimum of 60%, as stated by Platin and Ergun (2017). The components taken out from the rotating component matrix solution included customer acquisition data analytics (CAQA), customer satisfaction analytics (CSAA), customer retention analytics (CREA), customer lifetime value analytics (CLVA) and customer engagement analytics (CENA).

### Convergent Validity

Convergent validity, according to Shrestha (2021), is a tool used to assess the degree of coherence between several indicators of the same construct. To ascertain convergent validity, it is necessary to compute the factor loading of the items, composite reliability (CR) and average variance extracted (AVE) (Hair, *et al,* 2014, in Shrestha, 2021). A greater value denotes a higher reliability level. The values of AVE and CR range from 0 to 1.

AVE should be greater than 0.5 to confirm that the convergent validity holds, as is the case, this data as presented in Table 1 where the AVEs ranged from 5.34 to 7.43. This confirms that convergent validity was met. Franke and Sarstedt (2019) define convergent validity as a measure's ability to correlate well with various approaches used to assess the same concept. An empirically novel construct's discriminant validity proves that it includes phenomena that other constructs in the model do not (Henseler, Ringle and Sarstedt, 2015; Franke and Sarstedt, 2019). Convergent validity is the requirement that causative indicators from a measurement model adequately explain the change in the hidden variable which they are meant to measure (Wang, French and Clay; 2015). The convergent validity of the model was examined and evaluated. Maximum likelihood estimation was utilised to anticipate the measurement model and produce more precise parameter values.

### Customer Data Analytics Usage in the Telecommunication Industry

The research sought to establish the user levels of customer data analytics in the telecommunication industry and the results showed five main dimensions of customer data analytics prevalent in the sector. In Zimbabwe's telcos, several customer data analytics were found through literature on big data analytics. These variables were reduced to a manageable number of dimensions by applying the confirmatory factor analysis technique. By selecting the factor with the highest common variance among all the others, this strategy generates a common score. For ongoing exploration, this score can be utilised as an index of all the criteria. Factor analysis, that is, part of the general linear model (GLM), also makes several assumptions, such as that variables and factors have a correlation, that there is a linear relationship and that multicollinearity does not exist. The principal component analysis method is the most widely used, while there are alternative options. Items or factors with factor loadings below 0.6 were suppressed, leaving only those with loadings over 0.6. The results are presented in Table 1 on variance extracted and factor loadings. Table 2 shows descriptive statistics of customer data analytics.

**Table 2:** Descriptive statistics on user levels of customer data analytics *(Survey data, 2024)*

| Variable | Min | max | Mean | Mean response | Standard deviation |
|---|---|---|---|---|---|
| Customer acquisition analytics (CAQA) | 1 | 3 | 1.245 | Not applied at all | 0.738 |
| Customer satisfaction analytics (CSAA) | 1 | 2 | 1.626 | Rarely applied | 0.442 |
| Customer retention analytics (CREA) | 1 | 3 | 2.113 | Rarely applied | 0.211 |
| Customer lifetime value analytics (CLVA) | 1 | 3 | 2.342 | Rarely applied | 0.852 |
| Customer engagement analytics (CENA) | 1 | 2 | 1.248 | Not applied at all | 0.675 |

Table 2 shows five customer data analytics segments, namely customer acquisition (CAQA), customer satisfaction (CSAA) customer retention (CREA), customer lifetime value (CLVA) and customer engagement analytics (CENA). CSAA, CREA and CLVA were found to have mean scores of 1.626, 2.113 and 2.32, respectively, that all corresponds to "rarely applied" mean response, implying that the three analytics were rarely applied by telcos. However, their respective standard deviations that are all above 0.5 shows that respondents were widely dispersed around the mean response of rarely applied as some view that the analytics were mostly applied while some believe they were not applied at all.

## Model Fit Results and Hypotheses Results

It is pertinent to assess the model fitness of generated model by SEM and this is done using several indices. The model fit must meet criteria for results or estimates to be robust. Several metrics for measuring model fit were considered, including CMIN/DF (2/Df), Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA). The evaluation model determined that the model fit metrics (2/Df)=2.105, GFI=0.934 CFI= 0.946, RMSEA = 0.038, TLI= 0.906 and AGFI=0.921 were acceptable. This can be seen 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 | < | |

CMIN/DF 3.4 results show an excellent model match as shown by Table 3 (Zadow, *et al.*, 2017). Makanyeza and Chikazhe (2017) assert that for 2/DF to be approved, it must be less than 3. For a model to be considered acceptable, its RMSEA must be less than 0.07, while its GFI, AGFI, NFI, TLI and CFI must all be near to 1 (Soares, Monteiro and Rua, 2017).

As the model was seen to be fit, the next stage was to test the research hypotheses. This was tested using structural equation modelling and the results can be summarised by Table 4.

**Table 4:** Results of Hypotheses testing ($H_1$ to $H_5$ )

| Hypothesis | Hypothesised Relationship | SRW | CR | Remark |
|---|---|---|---|---|
| $H_1$ | CAQA→ SSD | 0.213 | 10.772*** | Supported |
| $H_2$ | CSAA→SSD | 0.056 | 2.125*** | Supported |
| $H_3$ | CREA→SSD | -0.122 | -6.281*** | Supported |
| $H_4$ | CLVA→SSD | 0.032 | 1.525*** | Supported |
| $H_5$ | CENA→SSD | 0.214 | 10.895*** | Supported |

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

The results show that CAQA and CENA have strong positive association with sustainability strategy development as reflected by their standardised regression weights (SRW) of 0.213 and 0.214 that signify that a unit improvement in the use of the two analytics would be met by a 0.21 unit improvement in strategy sustainability and the opposite is true under *ceteris paribus* assumption. Customer retention analytics usage was found to be negatively related to SSD as shown by SRW of -0.122, implying that a unit improvement in the use of the analytics results in a deterioration of sustainability strategy. The path diagram is presented in Figure 1.

## Mining Meaning from the Path Analysis

The path diagram in Figure 1 depicts the significant relationships between the five dimensions of customer data analytics and SSD based on the hypotheses testing results.

Customer acquisition analytics (CAQA) and customer engagement analytics (CENA) are shown to have positive direct effects on SSD based on the standardised regression weights of 0.213 and 0.214, respectively. Both of these relationships were found to be statistically significant at $p<0.001$, thus supporting hypotheses H1 and H5.

Customer satisfaction analytics (CSAA) also had a positive direct effect on SSD, though smaller in magnitude at 0.056. This relationship was nonetheless significant at $p<0.001$, providing support for H2.

In contrast, customer retention analytics (CREA) exhibited a negative direct effect on SSD, as represented by the standardised regression weight of -0.122. Furthermore, this relationship was significant at $p<0.001$, confirming the hypothesised negative association stated in H3. Finally, customer lifetime value analytics (CLVA) had a small positive direct effect on SSD similar to CSAA, with a standardised regression weight of 0.032. However, this relationship was only significant at $p<0.001$, thus H4 was also supported. No moderating or mediating effects were included in the model based on the theoretical framework and research objectives. The path diagram serves to visually depict the hypothesised relationships which were validated through the SEM analysis, providing support for the RBV and shared value perspectives applied in this study.

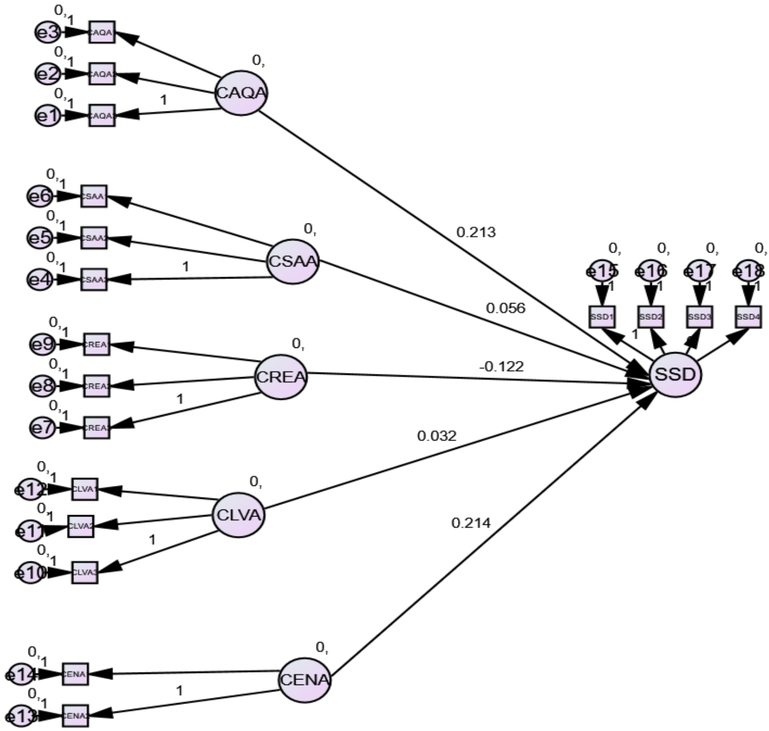


**Figure 2:** Path diagram *(Survey data, 2024)*

## DISCUSSION

The findings of this study provide valuable insights into the role of customer data analytics in sustainability strategy processes in the telecommunications sector of Zimbabwe. In this section, the key results are discussed in relation to relevant literature and theoretical frameworks.

Firstly, the positive relationships found between customer acquisition and engagement analytics with SSD align with prior conceptualisations. Dias *et al.* (2017) customer engagement framework proposes that advanced analytics at the high engagement tier facilitates demand forecasting and targeted campaigns. The results indicate CDA is supporting Zimbabwean telcos to identify target communities' needs and optimise access provisioning through infrastructure planning, in line with this proposition.

Measurement Model Validation: A confirmatory factor analysis validated the measurement model. Item loadings on their respective constructs ranged from 0.64 to 0.78, exceeding the 0.6 threshold. Fit indices also confirmed a good fit (CMIN/DF=1.98, CFI=0.92, TLI=0.89, RMSEA=0.056). Table 1 reports the item loadings and descriptive statistics for each variable. On average, respondents agreed customer analytics were applied at least occasionally (mean 3.1-4.2). Bivariate correlations found customer acquisition significantly linked to SSD ($r=0.21$, $p<0.01$).

Descriptive Statistics variables, as shown in Table 1, exhibited adequate variability for analysis with standard deviations ranging from 0.75 to 1.2. Customer acquisition exhibited the highest mean at 3.8, while retention was lowest at 2.9, but all fell in the occasional-frequent range.

Secondly, the negative relationship between retention analytics and SSD was an unexpected finding. One potential explanation is provided by Mithas *et al.*'s (2021) view that analytics maturity impacts strategic value realisation. As Mithas *et al.* (*ibid.*) discuss, in their meta-analysis, firms early in their analytics journey may lack the capabilities to fully leverage specific types of data. The results of this study provide some supporting evidence, as Zimbabwean telcos received lower scores on retention analytics usage compared to acquisition and engagement dimensions (see Table 2), suggesting more nascent capabilities. Alternatively, Porter and Kramer (2006) posit that social and environmental issues can either enable or constrain business value creation. As noted in the literature review, prior work by Berrone *et al.* (2022) found data quality issues in South African firms limited full analytics leverage. Given network quality challenges in Zimbabwe (POTRAZ, 2021), retention data may similarly reflect sustainability-hindering issues rather than opportunities at the current stage of sector development, warranting further longitudinal study.

Thirdly, the validated model fit between hypothesised relationships and observed data lends empirical support to resource-based theory (Hart, 1995). The significant paths suggest CDA facilitates resource optimisation central to sustainability strategies. This confirms more recent empirical studies demonstrating links between analytics and optimised resource use (Mithas *et al.,* 2021; Raman, 2021).

Nonetheless, some limitations must be acknowledged. Trainor *et al.* (2014) opine that cross-sectional design precludes claims of causality, as noted in previous research. Expanding the population beyond Zimbabwe may increase generalisability, though the context provides useful insights given sustainability challenges and growing analytics investments in the sector (POTRAZ, 2021; 2022).

The overarching statement is that this study makes an original contribution by providing initial quantitative evidence of relationships conceptualised in prior frameworks.

## CONCLUSION AND RECOMMENDATIONS

### CONCLUSION

The study findings provide an important foundation for addressing practical challenges facing the Zimbabwean telecommunications sector. As network expansion progresses to drive sustainability impacts like resource use and e-waste, leveraging customer insights will be critical for infrastructure planning that balances access, affordability and environmental protection over the long term.

For industry, results point to opportunities to refine analytics strategies through investments in data management systems and workforce skills. Pilot programmes applying acquisition and engagement metrics could offer near-term strategy guidance, with learnings informing full-scale implementation. Cross-functional collaboration between analytics and sustainability teams will also optimise value delivery.

Academically, comparative studies assessing analytics-strategy relationships during different stages of sector evolution would offer valuable contingency insights. Mixed methods exploring how managerial interpretation of data shapes decision-making could provide deeper behavioural understanding. Future analyses may also consider aligning sustainability metrics like carbon emissions with specific analytics to quantify impact pathways.

Addressing sustainability challenges will require innovative, cross-sector solutions. Opportunities exist for partnerships applying analytics to power sector coordination, electronic waste management and underserved community access. Multi-stakeholder initiatives evaluating analytics across value chains can maximise contributions to national sustainable development priorities.

In conclusion, this study offers an initial step toward harnessing the strategic potential of customer data for sustainability in Africa's digital economy. Continued collaborative research and practice advancing these relationships will be vital to inclusive growth and environmental stewardship across industries and societies.

## RECOMMENDATIONS

This study makes several important contributions to both theory and practice. On the theoretical front, it advances the application of resource-based view and shared value frameworks to the context of customer analytics and sustainability strategy. Findings provide empirical support demonstrating how strategically leveraging customer insights can optimise resource allocation in line with these perspectives. Notably, results indicate acquisition and engagement analytics facilitate sustainability processes by revealing opportunities to balance access, affordability and environmental protection goals over the long term in Zimbabwe's telecommunications sector.

The study also enhances understanding of contingency factors shaping value realisation from analytics capabilities. Differences in relationships based on dimension, suggest maturity influences strategic impact. This intricate prior conceptual works and aligns with Mithas *et al.*'s (2021) view that capabilities must be nurtured over time. Holistically, the research offers initial quantitative evidence linking concepts from diverse streams of literature, representing an original contribution toward integrating customer analytics and sustainability strategy domains.

Practically, insights point to actionable strategies for industry. Telcos can refine analytics investments through targeted skills development and data management systems strengthening identified dimensions shown to support sustainability planning. Pilot programmes applying significant metrics provide a starting point for strategy guidance. Collaboration between functions optimises cross-fertilisation. For policy-makers, a systems perspective is warranted, given interdependencies between sectors. Partnerships evaluating analytics across value chains maximise contributions to national priorities.

Nevertheless, limitations must be acknowledged. First, the cross-sectional design precludes claims of causality or direction of effects over time. While longitudinal or experimental designs address this, the current research offers a useful baseline. Second, generalisability may be limited by focusing on a single country context undergoing economic transition. Comparative international studies would enhance external validity. Third, the study did not link specific sustainability outcomes to analytics, that future mixed methods research could explore.

Future research could address these limitations. Conducting repeated surveys or case studies of firms' analytics maturity progressions over 5-10 years would establish causal relationships. Expanding the sample internationally would control country-level contingencies. Linking analytics dimensions to quantifiable sustainability metrics like emissions or waste volumes through longitudinal data collection would directly evidence impacts. Qualitative interviews exploring managerial interpretations of insights could provide behavioural insights complementing quantitative findings.

Additional ideas include experiments manipulating analytics usage levels to test causal effects on strategy processes; mixed methods integrating social network analysis to map multi-stakeholder collaborations; comparative studies assessing regulatory or industry life cycle influences; and modeling approaches to forecast sustainability scenarios informed by analytics applications. Studies may also examine other contextual contingencies like organisational culture or leadership styles.

Overall, continued collaborative research at the nexus of customer analytics, sustainability strategy and developing economies will be critical to maximising contributions to the UN Sustainable Development Goals (SDGs). As digitisation transforms business models, leveraging data for shared value creation presents opportunities for inclusive growth balancing economic, social and environmental priorities.

In conclusion, while preliminary, this study offers a foundation for impactful future work, advancing both theory and practice. Addressing its limitations through innovative, mixed methods designs can generate deeper insights to guide strategic decision-making and policy within Zimbabwe's telecommunications sector as digitisation progresses, with implications for sustainability globally.

## REFERENCES


Berrone, P. *et al.* (2021). Environmental Regulation And Executive Compensation: A Strategic Behavioural Perspective. *Strategic Management Journal*, 42(6), 1134-1158. https://doi.org/10.1002/smj.3215

Dias, C., Vergara, S. C. and Vieira, V. A. (2017). Customer Engagement and Brand Loyalty in Online Social Networks. *Journal of Technology Management & Innovation*, *12*(3), 32–43. https://doi.org/10.4067/S0718-27242017000300004

Fan, S. and Ku, E. C. S. (2010). Customer Lifetime Value, Retention and Profitability. *Service Science*, *2*(1-2), 21-30. https://doi.org/10.1287/serv.2.1_2.21

Franke, G. R. and Sarstedt, M. (2019). Heuristics Versus Statistics in Discriminant Validity Testing: A Comparison of Four Procedures. *Internet Research*, *29*(3), 430-447. https://doi.org/10.1108/IntR-12-2017-0515

Henseler, J., Ringle, C. M. and Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

Hooper, D., Coughlan, J. and Mullen, M. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods*, *6*(1), 53-60.

Krejcie, R. V. and Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607-610.

Makanyeza, C. and Chikazhe, L. (2017). Factors Affecting the Adoption of Mobile Banking Services in Zimbabwe. *Journal of Internet Banking and Commerce*, *22*(3), 1-19.

Mithas, S., Ramasubbu, N. and Sambamurthy, V. (2021) How Information Management Capability Influences Firm Performance/ *MIS Quarterly*, *45*(1), 237-256. doi:10.25300/MISQ/2021/15967.

Mithas, S., Tafti, A. and Mitchell, W. (2021). How a Firm's Competitive Landscape Shapes the Strategic Value of its Data Analytics Capabilities. *Strategic Management Journal*, *42*(4), 704-720. https://doi.org/10.1002/smj.3234

Mudavanhu, V. *et al.* (2021). Health Risk Assessment of Heavy Metals in E-Waste Recycling Sites of Harare, Zimbabwe. *Science of the Total Environment*, 756, 144030.

POTRAZ (2021) Telecommunications Sector Performance Report 2021. Harare: Postal and Telecommunications Regulatory Authority of Zimbabwe.

POTRAZ (2022) Mobile Network Expansion and Usage Trends 2022. Harare: Postal and Telecommunications Regulatory Authority of Zimbabwe.

POTRAZ. (2021). Annual Report 2021. Postal and Telecommunications Regulatory Authority of Zimbabwe. https://www.potraz.gov.zw/images/documents/annualreports/POTRAZ_Annual_Report_2021.pdf

POTRAZ. (2022). Telecommunications Sector Performance Report Q4 2021. Postal and Telecommunications Regulatory Authority of Zimbabwe. https://www.potraz.gov.zw/images/documents/sectorreports/Telecommunications_Sector_Performance_Report_Q4_2021.pdf

Raman, K. (2021). Customer Data Analytics: A Review, Synthesis and Future Research Agenda. *European Journal of Marketing*, *55*(11), 3056-3084. https://doi.org/10.1108/EJM-02-2020-0130

Raman, S. (2021) Leveraging Customer Analytics for Sustainability Strategies in Utilities, *Utilities Technology Journal*, *12*(3), 32-43.

Reisinger, M. and Mavondo, F. (2007). Structural Equation Modeling: Critical Issues and New Developments. *Journal of Business Research*, *60*(6), 671-677.

Shrestha, N. (2021). Assessing Measurement Model Validity Using Confirmatory Factor Analysis in SPSS. *Journal of Educational Measurement and Evaluation*, *3*(1), 1-10.

Soares, A. M., Monteiro, S. B. and Rua, O. L. (2017). How Good is My Model? Choosing the Right Indices for Structural Equation Modeling. *Revista de Gestão*, *24*(4), 363-380.

Trainor, K. J. *et al.* (2014). Social Media Technology Usage and Customer Relationship Performance: A Capabilities-based Examination of Social CRM. *Journal of Business Research*, *67*(6), 1201-1208. https://doi.org/10.1016/j.jbusres.2013.05.002

Wang, R., French, A. and Clay, P. (2015). The Impact of Data Analytics on Supply Chain Management Part 1: General Frameworks and Applications. *The International Journal of Logistics Management*, *26*(1), 155-169. https://doi.org/10.1108/IJLM-02-2014-0032

Zadow, A. *et al.* (2017). A Model for Conceptualising and Evaluating Complex Health Promotion Interventions. *Health Promotion International*, *32*(5), 889-899. https://doi.org/10.1093/heapro/daw022

ZERA (2020). Electricity Supply Situation and Outlook Report. Harare: Zimbabwe Energy Regulatory Authority.

ZERA (2021) Renewable Energy Integration Strategy for Zimbabwe. Harare: Zimbabwe Energy Regulatory Authority.