ESI Preprints **Not Peer-reviewed**

Complexity of Electronic Marketing towards Performance of Gas Energy Companies in Tanzania: Insight from Innovation Diffusion Theory

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Doi: 10.19044/esipreprint.9.2025.p11

Approved: 05 September 2025
Posted: 07 September 2025

Cite As:
Yohana, A., Shayo, F. & Mbura, S. (2025). *Complexity of Electronic Marketing towards Performance of Gas Energy Companies in Tanzania: Insight from Innovation Diffusion Theory.* ESI Preprints. https://doi.org/10.19044/esipreprint.9.2025.p11

Abstract

The purpose of this study was to investigate the complexity of electronic marketing on the performance of gas energy companies in Tanzania with insight from Innovation Diffusion Theory. Data were gathered using a structured questionnaire sent to a convenience sample of 302 employees from Gas Company Tanzania Ltd, Taifa Gas Ltd, Lake Gas Ltd, Oryx Gas Ltd, and Pan African Energy Ltd. The study used an explanatory research design. Structural equation modelling was applied to data analysis to find the causal link between company performance and the complexity of electronic marketing. Results revealed quite a strong positive correlation between company performance measures and the complexity of electronic marketing. These results advise businesses in the gas sector to give training programme investments top priority in order to improve the simplicity of learning and application of electronic marketing tools. Organisations should also make sure staff can access structured learning opportunities and user-friendly systems. Reducing the entrance barrier for staff by means of simplified tool interfaces and consistent training can help to maximise their output in using electronic marketing solutions. Gas businesses should also concentrate on developing internal knowledge and encouraging a culture of appreciation for the advantages of electronic marketing.

Keywords: Complexity; Electronic Marketing; Company Performance; Gas Energy; Innovation Diffusion Theory

Introduction

Companies cannot rely just on the evolution of innovative technologies or differentiation through technological and functional factors to guarantee a competitive edge in the present competitive market environment (Hur & Kim, 2023). Concurrent with this is growing recognition that a company's profitability and competitive edge are much enhanced by design and aesthetic aspects. Adopting new digital technologies is essential for energy organisations since these developments can greatly increase operational efficiency, lower risks, and lower costs, thereby maximising industry profitability (Al-Rbeowitz, 2023).

The introduction of creative information and communication technologies (ICT) has changed company operations and made these instruments indispensable for creating and improving company value. Particularly, developments in ICT have made electronic marketing a major determinant of the performance of many companies in the complicated corporate environment of today (Alalawneh et al., 2022). By reaching larger audiences, enhancing customer involvement, and gathering important data for exact advertising tactics, companies can improve performance by means of electronic marketing innovation. Combining such technology can help companies increase customer experience, raise brand awareness, and stimulate income generation.

Furthermore, good innovations in electronic marketing can improve customer acquisition, retention, and loyalty, thus strengthening sales and the general performance of the company. Many scholars have underlined how digital innovation could propel better financial performance and sustainable development (Arokodare et al., 2020). Adoption of modern digital marketing tools not only aids sustainable development but also helps companies to reach outstanding financial results (Tahaniana et al., 2021). Still, the relationship between digital marketing developments and organisational effectiveness is complex and shaped by factors including company size and marketing capacity. Smaller companies could have limited resources, for example, whereas bigger companies could find it difficult to adopt new technologies (Yu et al., 2020). Fast technology developments and accelerating globalisation force businesses to always be creative and flexible. More innovative companies are more suited to adapt to environmental changes and create new capacities, therefore developing new skills and hence improving performance (Turulja & Bajgorić, 2016). Rodgers (2003), in his theory of innovation diffusion, introduced complexity as a factor for

the diffusion of innovation. Meaning that innovation should not be difficult to make it easy for diffusion.

Adopting electronic marketing, according to Gao et al. (2023), lowers both tangible and intangible communication costs, so allowing marketing managers to engage more successfully with possible consumers, thus encouraging sustainable corporate performance. Marketing's technological developments also enable businesses to track, assess, and personalise their policies with before unheard-of precision. Arokodare et al. (2020) noted, however, that many businesses, especially in Nigeria's oil and gas sector, have suffered from competitive disadvantages resulting from insufficient adoption of IT capabilities, poor strategic foresight, and a lack of agility in handling issues related to technological advancement, globalisation, and changing customer preferences. Comparably, studies by Arokodare and Asikhia (2020) and Oyerinde et al. (2018) show how inadequate strategic agility has compromised the competitive stability and performance of oil and gas marketing companies.

Recent research by Mihai et al. (2022) reveals that digitalising the energy sector to improve sustainability is a complicated process, including major changes. Many times, this change has led to quick choices aimed at lowering or eradicating direct contact between consumers and energy producers. Digital platforms for invoicing, payments, and reporting power problems, as well as sensor, digital meter, and intelligent control system installation, have helped to accomplish this (Zakharkina et al., 2022).

Notwithstanding these developments, the intricacy of electronic marketing still presents difficulties in organisational environments and sometimes aggravates financial losses. Park and Mithas (2020) contend that the complex nature of digital tactics and interventions, an area often studied by information systems researchers, causes such complexity. Inspired by the Innovation Diffusion Theory, complexity, especially in some gas energy companies, is characterised as the difficulty of using technological tools to market products. This paper investigates how the e-marketing complexity affects the performance of gas energy firms in Tanzania.

Literature Review

Theoretical Literature Review: Innovation Diffusion Theory (IDT)

Introduced by Rogers (1962), the Innovation Diffusion Theory (IDT) investigates the phases a new technology or invention passes through to affect society and its people. It underlines how knowledge of an idea spreads over time and how this affects its acceptance by people or companies. The notion holds that innovations have to pass through a communication process if they are to have a social influence. Diffusion is the process by which an innovation spreads over particular communication channels inside a social

system. Roman (2003) listed the main components of this process: the innovators, the adopters, routes of communication, time, and the social structure.

Relative advantage, compatibility, complexity, trialability, and observability, among other elements, determine the acceptance of innovations (Atkin et al., 2015). Using relative advantage, compatibility, complexity, trialability, and observability to better understand how technology is adopted and diffused, researchers, including Tokarčíková and Kucharčíková (2015) and Kocak et al. (2013), have used IDT to examine electronic marketing channels. By means of processes including innovation, communication channels, adopters, time, and social systems, IDT shows that electronic marketing can help to facilitate the spread of information, thereby raising consumer awareness and adoption rates (Moctezuma & Rajagopal, 2016). Moreover, da Silva et al. (2010) concluded that using electronic tools might improve organisational performance. The idea has been attacked, however, for its scant attention to psychological elements since consumer acceptance of new items usually differs greatly (Midgley & Dowling, 1978).

Empirical Literature Review

Complexity of Electronic Marketing on the Performance of Gas Energy Companies

Pérez-Luño et al. (2018) investigated business performance in relation to complexity, cross-functional integration (CFI), knowledge intricacy, and product innovation. The study concentrated on examining how a given CFI mechanism affects the link between the performance of products inside companies and innovation. From a contingency point of view, the study investigated how these dynamics differ in the degree of organisational knowledge complexity. Data from 105 Spanish wineries were examined using regression analysis with interaction effects and including both subjective and objective company performance metrics. On company performance, the results exposed a notable triple interaction effect among CFI, knowledge complexity, and product innovation. The study underlined a negative moderating influence of CFI on the innovation-performance link, which changes with the degree of knowledge complexity. The report advised that integrating technicians across sectors for coordination may drain resources from innovation initiatives, therefore harming performance, unless companies suffer high degrees of information complexity.

With an eye on government impact, Huynh et al. (2023) investigated how technological innovation, complexity, and co-creation affected organisational performance. Emphasising how technical complexity and co-creation improve innovation and performance, the study sought to find elements impacting technology innovation and its contribution to

organisational performance. Structural equation modelling was used to examine data gathered from a 323-management professional poll of Vietnam's manufacturing sector. The findings showed that co-creation, government influence, and technological complexity greatly increase technology innovation, which improves organisational performance, by means which technical innovation is boosted. The research also revealed indirect consequences of government impact on organisational results, thus advising the industrial sector to use these ideas to promote creative ideas in its environment.

Emphasising small and medium-sized Jordanian eateries, Alalawneh et al. (2022) examined the intricacy of interactions between social media platforms (SMPs) and organisational effectiveness. With competitiveness intensity acting as a moderating element, the study investigated the link between SMP usage and organisational outcomes. By use of partial least squares (PLS) techniques, data from 331 examined restaurants revealed a positive correlation between SMP usage and performance indicators, including financial, marketing, and operational outcomes. Moreover, the link between SMP use and marketing performance was much mediated by competition level.

Hur and Kim (2023) studied how company performance, design creativity, and technological complexity interact. The study concentrated on figuring out how design innovation might help to offset the detrimental impacts of technology complexity on performance. Examining data from 16,565 US companies covering 1980–2015, researchers computed technological complexity depending on structural variety within technologies. Results verified that design innovation is a strategic resource that enables companies to maximise complicated technology and generate financial benefits via more efficient use of it. By realising design innovation as a competitive advantage in negotiating technical complexity, the study added to the resource-based vision of the company.

Methods

This study employed an explanatory research design to investigate the impact of the complexity of electronic marketing on the performance of gas energy companies in Tanzania, guided by the framework of Innovation Diffusion Theory (IDT). This design allowed the analysis of numerical data to identify important correlations and possible causal ties (Creswell & Creswell, 2017), therefore facilitating exact measurement of variables. With a total sample size of 302 respondents, this study was carried out in the Dar es Salaam area, concentrating on a selection of gas energy companies: Gas Company Tanzania Ltd, Tifa Gas Ltd, Lake Gas Ltd, Oryx Gas Ltd, and Pan African Energy Ltd.

Structured questionnaires with closed-ended questions meant to provide quantitative insights gathered the data. The closed-ended objects counted responses on a 5-point Likert scale. Aligning with the ideas of Innovation Diffusion Theory, structural equation modelling approaches were used in data analysis to evaluate the cause-effect relationship between the complexity of electronic marketing and corporate performance.

Data coding, cleansing, and analysis were done using IBM SPSS Statistics version 20; IBM SPSS Amos 23 was then used to assess the measurement model fitness for the COMPL construct. Strong connections were found by means of confirmatory analysis with a significance level set at p-values below 0.05 and C.R. around 1.96. This research technique quantified the effects of electronic marketing complexity on organisational performance, thereby guaranteeing the generalisability of results. Moreover, it tested the relevance of complexity as a construct inside the framework of Innovation Diffusion Theory and assessed the relevance and intensity of causal links.

Results

Confirmatory Analysis Results

Measurement Model for Complexity (COMPL)

IBM SPSS Amos 23 was employed to evaluate the measurement model fitness for the COMPL construct, which comprised five factors: COMPL1, COMPL2, COMPL3, and COMPL4. The model fit indices computed in the first stage of confirmatory factor analysis (CFA) were used to evaluate the alignment between the observed data and the proposed model. With CMIN/DF = 3.139, GFI = 0.981, AGFI = 0.942, CFI = 0.973 and RMSEA = 0.085, the first fit indices were. While several indices reached reasonable limits, the overall findings showed that the model fell short of the benchmark levels given in Table 4.9. Thus, it was necessary to further modify and change the model to attain suitable fit indices and raise the validity of the construct. The refinement procedure follows the advice given by Schumacker and Lomax (2004), who advise giving the removal of variables with high covariance and strong regression weights top priority in the modification indices (MI), hence improving model performance. Candidates for deletion were also objects with standardized regression weights (SRW) below the essential threshold of 0.5. These processes guaranteed that the final model included those objects that really added value to the construct.

Examining the AMOS output closely revealed problematic items influencing the fit of the model. For example, the item e4 -->e2 was reported for removal under COMpl4 with a MI of 7.586 and a parameter change of -0.051. Eliminating this item corrected its negative impact on the general fit

of the model, as Table 4.1 shows. This change was a major step toward bettering the measuring model. Methodically eliminating elements that compromised the validity of the construct helped to improve the latent variable representation. The changes guaranteed that the construct was shown more precisely and clearly than the other elements. These changes laid the foundation for later validation and hypothesis testing by helping to produce a model stronger and more suited for additional study.

Table 1: Covariances Second Run For COMPL

			M.I.	Par Change
e3	<-->	e1	4.085	.035
e4	<-->	e2	7.586	.051

Source: Researcher (2024)

Following the removal of the problematic items, the confirmatory factor analysis (CFA) performed using IBM SPSS Amos 23 showed that the updated model suited the data remarkably. The notable improvement in the fit indices attests to the fact that the changes implemented during the refining phase sufficiently corrected the prior flaws. With CMIN/DF = 0.815, GFI = 0.997, AGFI = 0.686, CFI = 1.000, RMSEA = 0.000, and SRMR = 0.0126, the revised fit statistics were. These findings show that the model either meets or surpasses all generally accepted criteria for model fit, so closely matching the observed data. The individual fit indices offer a comprehensive view of the general performance of the model: the highly acceptable degree of parsimony indicated by the CMIN/DF value of 0.815, which is much below the conventional cut-off of 3.0, indicating no notable difference between the model and the observed data. Reflecting an outstanding fit to the data, the Goodness of Fit Index (GFI) of 0.997 and the Adjusted Goodness of Fit Index (AGGI) of 0.686 are both above the generally agreed criterion of 0.90. With a perfect fit indicated by the Comparative Fit Index (CFI) of 1.000, the revised model totally describes the connections among the observed variables with respect to a baseline model. With a value of 0.000, the Root Mean Square Error of Approximation (RMSEA) value indicates an exceptional model fit since it is much below the allowed upper limit of 0.08, therefore showing minimal approximation error in the population. Finally, since the Standardized Root Mean Residual (SRMR) value of 0.0126 is significantly below the threshold of 0.05, so demonstrates small residual discrepancies between the observed and predicted correlations, so verifying a very excellent match.

These indices together confirm that the updated model is now appropriate for more research and offers a great representation of the observed data. Crucially, the kept objects exhibit great internal consistency and strong standardized regression weights, therefore adding significantly to

the latent construct. The modified model is shown in Figure 4.1, stressing the better connections between the latent variables and their related objects. The graph shows how the changes improved the validity and structure of the model so guaranteeing that it conforms with empirical facts and theoretical predictions. This stage signifies significant progress in the analytical process since it offers a strong basis for the interpretation of results and additional hypothesis testing.

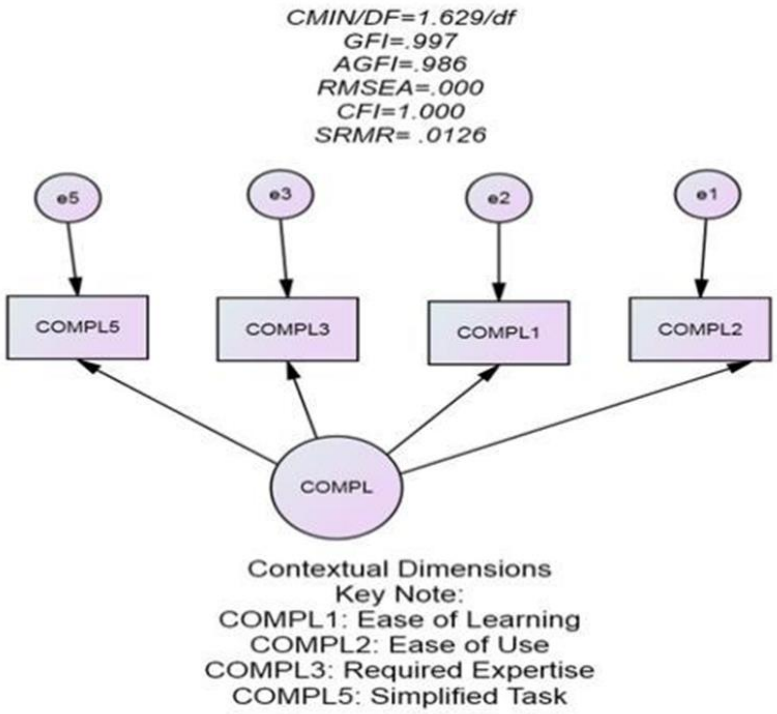

Figure 1: Measurement Model for COMPL

Discussion of Findings

This study looks at how complexity affects Tanzanian gas energy company performance. With a standardised route coefficient of $\lambda = 0.166$, the results show a somewhat favourable association between complexity and organisational success. This implies that good management of complexity can improve business performance, along with Hoe's (2008) finding that a standardised path coefficient of 0.2 or above shows a significant correlation. Although the results underline the relevance of complexity as a performance-enhancing element in Tanzania's gas energy industry, the results are much below this level.

Key elements of complexity, including ease of learning, simplicity of use and cognitive demand connected with systems and processes, greatly influence employees' interactions with technology, promote innovation, and

maintain operational efficiency. Further statistical study validates the strength of the association between complexity and performance. With a critical ratio (C.R.) of 1.987, above the 1.96 threshold, and a p-value of 0.047, below the conventional significance level of 0.05, Hox and Bechger's (2014) criteria for statistical dependability line up. Individual complexity indicators also showed strong explanatory ability. With critical ratios exceeding the threshold and p-values below 0.001, the standardised path coefficients for ease of learning (COMPL1), ease of use (COMPL2) and cognitive perception (COMPL5) were 1.838, 1.960 and 1.000, respectively. These results stress the need for user-friendly solutions in maximising organisational results in gas energy enterprises.

The results line up with research by Smith and Johnson (2015), which found that in manufacturing organisations using technical support systems, technological complexity and performance showed a favourable correlation. Their findings were that complexity promotes creativity and adaptation, which speaks to the impact of simplicity of learning (COMPL1) and simplicity of use (COMPL2) on efficiency in this study.

In the same vein, Cheng and Liu (2015) underlined that investments in system integration and staff training define the advantages of complexity. Their efforts in telecommunications complement the focus of this study on two fundamental aspects: ease of learning (COMPL1) and ease of usage (COMPL2). Garcia and Lopez (2015) also showed that lowering retail sector employee workflow complexity raised job satisfaction and output. This corresponds with the need for cognitive perception (COMPL5) in lowering mental demands and improving performance, as this study emphasises. Regarding logistics, while complexity might raise running expenses, Kumar and Sinha (2015) pointed out that it also encourages innovation and customising, which have long-term advantages. Their twin viewpoint emphasises the importance of industry-specific tactics while reflecting the results of this investigation. Park et al. (2015) also found that well-structured complexity increases adaptability in volatile markets; this conclusion corresponds with the adaptive techniques reported among Tanzanian gas energy businesses.

According to Harrison and Grant (2015), addressing the impact of complexity on international businesses mostly depends on organisational culture and good leadership. Their focus on technology integration and training fits the suggestions in this paper for leadership interventions.

Conversely, citing inefficiencies in pharmaceutical and financial institutions, respectively, Ravi and Patel (2015) and Miller et al. (2015) advised against the hazards of mismanaged complexity. These results highlight the part that contextual and industry-specific elements play in deciding the impact of complexity.

Finally, Tanaka and Nakamura (2015) investigated automotive industry complexity and found that teamwork improves performance. This viewpoint fits the results of the research, especially in relation to ease of learning (COMPL1) and its function in negotiating technological systems.

The results of this research also fit Rogers' (1962) invention Diffusion Theory (IDT), which describes how knowledge of an invention travels over time, therefore impacting its acceptance. As a variable in IDT, complexity is quite important in deciding how innovations are included in companies to raise performance. Emphasising simplicity of learning (COMPL1), ease of use (COMPL2), and cognitive perception (COMPL5), Tanzanian gas firm executives are advised to include complexity-oriented initiatives in view of these results. This would increase staff performance and confidence in organisations. Leaders have to give continuous employee support top priority so that they may solve problems and improve system integration, thus promoting long-term efficiency and creativity.

Conclusion

The analysis revealed a positive relationship between complexity and the performance of gas energy companies, with a standardised path coefficient ($\gamma = 0.166$). This implies that under its particular characteristics, complexity contributes to defining corporate performance. A deeper understanding of the relevance of this relationship comes from additional statistical analysis applying the critical ratio (C.R.) and p-value. The findings revealed a critical ratio (C.R. = 1.987) over the 1.96 threshold and a p-value of 0.047, which falls below the traditional significance criterion of 0.05. These results fit the criteria set by Hox and Bechger (2014), who say that a relationship is regarded as statistically significant when the p-value is less than 0.05 and the critical ratio surpasses 1.96.

These results lead the research to infer that the performance of gas energy firms in Tanzania is favourably and significantly improved by complexity. This suggests that, under proper control, the natural complexity of technologies and procedures might improve the performance of gas energy companies.

These findings emphasise the need for knowing and handling complexity in the gas energy sector. Companies should give tactics to properly handle complexity top priority: investing in staff training, streamlining processes, and using cutting-edge technologies to expedite operations are of top importance.

Recommendations

The results should drive gas sector businesses to give training programme investments in simplicity of learning and application of

electronic marketing tools as a top priority. These covers give staff members easy systems and organised training opportunities to improve their competency. Simplifying interfaces and guaranteeing consistent skill development will help to lower adoption obstacles and raise production.

Companies should also foster internal knowledge and help stakeholders to understand the strategic worth of electronic marketing. Hiring qualified experts and including technologies in important corporate activities would improve consumer involvement, simplify processes, and stimulate income generation. Promoting more acceptance and adoption also depends on teaching stakeholders about the benefits of electronic marketing.

Future Research Areas

This study presents many directions for further investigation on the intricacy of electronic marketing in the gas energy industry. Using a longitudinal perspective, one might look at the long-term effects of implementing electronic marketing tools on organisational performance, therefore pointing up elements that either maintain or improve benefits over time.

Comparative studies spanning sectors, including industry, renewable energy, or oil, could potentially highlight sector-specific opportunities and difficulties. This would offer an understanding of the flexibility and potency of electronic marketing in many environments.

Future research could look at how the adoption of electronic marketing is influenced by outside elements, including government policies and laws. Knowing how supportive or constraining policies influence the spread of innovation could help companies and legislators both to advance digital transformation. Furthermore, studies of consumer opinions on electronic marketing tools with an eye toward their function in enhancing user experiences will enable companies to create more customer-centric plans

At last, newly developed technologies like artificial intelligence (AI) offer interesting research prospects. Research could assess how predictive analytics and chatbots improve the efficacy of organisational efficiency and electronic marketing. In the Tanzanian setting, cultural elements in technology adoption also need investigation since they might expose particular regional or demographic insights that enable customising of policies for more general acceptance and use.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

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