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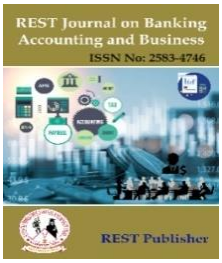

Evaluating Modern Banking Alternatives: A GRA-Based Performance Assessment of Traditional and Digital Financial Platforms

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Abstract: *Based on the document content, I'll create a comprehensive abstract that captures the key aspects of the research. The research investigates the performance and efficiency of various consumer banking platforms using Grey Relational Analysis (GRA). The study analyzed five distinct banking platforms—Online Banks (Nedbank's), Credit Unions, Peer-to-Peer (P2P) Lending, Fintech Solutions, and Cryptocurrency/Decentralized Finance (Deify)—across four critical dimensions: Customer Satisfaction, Digital Banking and Technology, Financial Products and Services, and Customer Support. The analysis employed normalized data, deviation sequences, and grey relation coefficients to establish comprehensive performance metrics. The findings reveal significant variations in platform effectiveness, with Fintech solutions achieving the highest Grey Relationship Grade (GRG: 0.7387), followed closely by P2P lending (GRG: 0.7064). Traditional platforms like Credit Unions maintained moderate performance (GRG: 0.5674), while Cryptocurrency/Deify (GRG: 0.5117) and Online Banks (GRG: 0.5115) showed considerable room for improvement. The research demonstrates that success in modern banking requires a balanced integration of technological innovation with customer-centric services, rather than excellence in isolated areas. These results hold significant importance for shaping the strategic growth of banking services and guiding the future advancement of financial technology platforms.*

Keywords: *Grey Relational Analysis (GRA), Consumer Banking Platforms, Financial Technology (Fintech), Digital Banking Services, Customer Satisfaction Metrics, Banking Performance Analysis, Peer-to-Peer Lending, Decentralized Finance (Deify), Customer Support Systems, Financial Service Innovation*

1. INTRODUCTION

Consumers frequently buy various products and services from the same provider over time. These products are often arranged by their complexity or nature, leading to patterns in consumer behavior where some products are typically purchased before others. This progression in the customer lifecycle can occur without direct influence from marketing efforts and can exert an external impact on the overall customer lifecycle [1].The financial services sector, especially retail banking, has experienced substantial transformations dueocombined forces of competitive pressure, evolving customer expectations, and technological advancementsService delivery has shifted as customers increasingly prefer technology-based self-service options over traditional face interactions [2].The changes that follow will greatly influence the growth and utilization of alternative delivery channels. A recent example is the rise of online banking. Numerous retail banks in developed countries have adopted electronic or online banking as a modern service delivery method. This channel is widely recognized for its substantial influence on the market. Banks understand that the Internet expands their reach, enabling them to transition from focusing on local markets to competing on a global level. [3]. The number and proportion of accounts held at a primary bank can serve as indicators of customer loyalty, though they are not as strong as SOW (share of wallet) deposits, since the distribution of savings and investments in dollar terms was assessed. However, the percentage of products used is considered more precise, as respondents can easily specify it, whereas SOW measures are reported by respondents in quartiles rather than the exact number of products used in the subsequent analysis. [5]. In recent years, advancements in information technology and the emergence of Internet banking have revolutionized the way banks function and how consumers handle their everyday banking needs (Erickson et al., Saar and Wolfe, 2001). Internet banking allows customers to perform a wide range of transactions through a bank's

website, offering the convenience of 24/7 access, quicker processing, and lower costs compared to traditional physical branches. [6]. In recent years, electronic banking technologies have become more widespread, with a diverse array of products now available, consumers have become more receptive to adopting them. These innovations include direct deposit, online banking, stored value cards, and debit cards. Banks and other financial institutions have invested considerable effort in developing and integrating these technologies.as they offer opportunities to enhance efficiency, lower costs, and attract new customers [7]. The study, which was based on primary data, revealed that the majority of bank customers in the Thoothukudi district, Tamil Nadu, are aware of the various banking services available. The study recommends that banks take appropriate measures to educate customers about new technologies and additional services they offer. Banks should also increase the time spent engaging with customers and adopt a friendlier approach. This approach will not only assist in retaining your current customers but also in attracting new ones. [8]. This study aims to explore how consumers with varying levels of expertise in Internet banking (IB) perceive different dimensions of IB. To begin, through in-depth open-ended interviews with eleven active Internet Banking users, key research themes and issues were identified. These results were then compared with insights from the literature review. Both the exploratory interviews and the literature review contributed to the development of a structured interview guide, which was used for face-to-face interviews to systematically collect data [9]. The responses related to personal finances display a U-shaped distribution. Moderate users give this dimension the lowest rating, while novice users score it higher, and expert users rate is higher than moderate users. This suggests that novice users are more likely to engage online with their personal account details. They can explore hypothetical scenarios involving features like calculating how long it would take to become a millionaire with a specific monthly savings, creating visual graphs of account transactions, and tracking personal spending and income ratios [10]. The rise of artificial intelligence (AI) is transforming customer reviews, particularly in banking. As AI-driven systems become more advanced, they enable personalized banking feedback that aligns with individual customer preferences and needs. AI is especially valuable in private banking scenarios, as it can identify patterns and extract insights from customers' financial behaviour that might go unnoticed by humans. Furthermore, AI can predict customer needs and opportunities based on this data [11]. It should uncover the "hidden knowledge" that aids in effectively segmenting customers into clusters. The concept of K-Means algorithms plays a central role here, encompassing methods such as K-Means, improved means, K-Medians, and hierarchical clustering. In this paper, we will focus on fuzzy clustering. Additionally, clustering banks can also be accomplished using similar machine learning techniques [12]. This article employs a straightforward game theory model to examine how various market structures or competitive conditions influence a bank's decision to enhance the quality of its services, whether targeted at retail businesses or individual consumers. We view enhancements in consumer service quality as "innovation" or the introduction of new service offerings. Since service innovation results in improved consumer service quality, it enables us to link our analysis to the extensive economic literature on banking decision-making. In particular, our study focuses on analyzing... builds upon existing research on how market structures affect product innovation [13]. Integrating the various channels through which advertising impacts demand into a single model is a challenging task. A key difficulty is the lack of access to comprehensive data that tracks the entire consumer purchasing process, from awareness to consideration and ultimately choice, which is crucial for identifying the specific roles of advertising. This paper utilizes extensive survey data to empirically separate the roles of advertising to assess how advertising impacts consumer decisions at various stages of the purchasing process and ultimately influences their choices. [14]. Considering that a supplier-consumer relationship built on trust demands greater transparency and, indirectly, full information from the customer regarding the products or services they purchase, it becomes evident that a long-term relationship between a bank and its customers offers numerous benefits. However, from this perspective, while such a relationship partially addresses the issue of asymmetric information, it also has the downside of diminishing competition within the banking sector, as consumers may lack the incentive to explore or acquire products or services from other financial institutions [15]. To expand their customer base, businesses should prioritize mass personalization of services, broaden marketing and communication channels, pursue innovative new services, and consider non-core business opportunities. However, a customer's ability to adopt Internet-based banking services is influenced by various factors, such as the user interface's User-friendliness, the customer's level of internet proficiency, and the variety of available services (such as email, file transfer, messaging, online financial services, shopping, multimedia, etc.) as well as their attitudes and perceptions, accessibility, service delivery time, and prior experience with the Internet. [16]. Drawing on insights from a literature review of factors affecting consumer behaviour toward internet and mobile banking services, we proposed a theoretical model comprising twelve hypotheses examining the relationships between these variables. To investigate and validate this conceptual model, we adopted a quantitative research approach involving a field study based on a questionnaire. The questionnaire was meticulously designed and pilot tested to detect and correct potential issues in content and design [17]. The survey findings highlight the importance for Romanian banks to enhance their efforts in offering financial education courses to all customer groups, whether they are young, middle-aged, or older adults. Additionally, in the context of the pandemic, these efforts need to be adapted and expanded primarily to online platforms, which requires an improvement in users' digital skills. In this context,

providing online tutorials is essential to help customers become more comfortable with digital channels, particularly those who have limited skills or are reluctant to use these alternatives [18]. Top banks are adopting a broader perspective on capacity, focusing on effectively leveraging employees and their roles both within individual branches and throughout the organization. By optimizing branch networks and adjusting staffing levels, banks can achieve cost savings from reduced capacity while preserving the flexibility to scale up capacity as required [19]. A recent study investigating the personal banking habits and preferences of customers in Poland revealed that... similar to well-established market economies, the main factors influencing bank selection in transitional economies are price, reputation, and service. However, Polish consumers may interpret these factors differently. The case of Poland is significant for several reasons. Notably, given A fairly recent transition to a "free market" in financial services, consumer behavior patterns are likely to differ from those observed in more mature market economies [20].

2. MATERIALS AND METHOD

Online Banks (Nedbank's): MBCA, one of Zimbabwe's oldest financial institutions and a leading name in banking, is undergoing a rebranding process to become Nedbank Zimbabwe. We invite you to be part of our transformation journey. (12 March 2018).

Credit Unions: Credit unions are member-owned cooperative financial institutions that offer standard banking services to their members. They generally provide a more limited range of products compared to traditional banks, they often offer better rates and greater access to ATMs.

Peer-to-Peer (P2P) Lending: Peer-to-peer trading involves the direct exchange of currencies between two traders, bypassing any centralized third party. Participants can use their preferred payment methods and finalize the transaction at a mutually agreed price.

Fintech Solutions: Financial technology, or finch, encompasses innovative technologies designed to enhance and automate the provision and use of financial services. At its core, finch enables organizations, business owners, and individuals to manage their financial operations, processes, and daily financial activities more efficiently.

Cryptocurrency and Decentralized Finance (Deify): Although Bitcoin and Ethereum's ETHER are the most well-known, not all cryptocurrencies are decentralized. Unlike centralized currencies, decentralized cryptocurrencies are not governed by central banks; instead, their programming code and monetary policies are managed by their respective communities.

Customer Satisfaction Customer satisfaction is an indicator of how pleased customers are with a company's products, services, and overall performance. Digital Banking and Technology**:** The leading banks of tomorrow will recognize that technology is not a constraint, but a tool to enable greater possibilities. They will leverage digital capabilities to empower customers and establish a preferred model for how customers engage with their bank and other service providers. A method that works for everyone will not be effective.

Financial Products and Services: Financial services encompass all services related to money. This includes banking, mortgages, credit cards, payment services, tax preparation and planning, accounting, and investing. The financial services industry is typically dominated by businesses and profess

Customer Support: Actively listening to customers involves comprehending their needs and offering dependable solutions that satisfy them, encouraging repeat business and loyalty.

GRA Method: In this paper, we introduce an enhanced fuzzy GRA method for addressing MCDM problems, where the criterion values are expressed as linguistic variables in the form of interval-valued triangular fuzzy numbers, and the criterion weights are not predefined. To determine criterion weights, multiple optimization models are created based on the fundamental principles of traditional GRA. The computational The steps of the extended GRA method for MCDM are then presented, utilizing interval-valued triangular fuzzy estimates to rank the alternatives and determine the best option.21]. The remainder of this paper is organized as follows: Section II reviews the existing work on network selection decision methods and provides an overview of GRA-based decision-making algorithms. Section III introduces proposed solutions to mitigate and eliminate the rank inversion phenomenon in GRA-based network selection. The performance results are presented in Section IV. Finally, the paper concludes with a summary and concluding remarks in the last section. [22]. Traditional culture represents the core of China's historical civilization. As an integral component of traditional culture, intangible cultural heritage It plays a crucial role in influencing the development of China's civilization and its socio-economic advancement. cultural and creative industry in China is expanding rapidly, exhibiting strong growth momentum. China's rich cultural heritage has supplied ample cultural capital for the advancement of the creative industry while contributing to the theoretical and practical framework for the Cultural and Creative Industry Park, which serves as a foundational element for the industry's growth [23]. The adoption of electric logistics vehicles will not only help reduce harmful emissions but also lower logistics costs. However, the lack of sufficient charging infrastructure remains a significant barrier to the widespread deployment of electric logistics vehicles. Sufficient charging infrastructure is essential for the widespread adoption of electric logistics vehicles, and the placement of these facilities must be strategically planned. Unlike the distribution of traditional fuel-powered vehicles, the

deployment of electric logistics vehicles faces distinct challenges, including limited battery capacity, inadequate charging facilities, and long charging times. As a result, traditional vehicle distribution strategies cannot be directly applied to electric logistics vehicle systems. [24]. The classical Gary relational analysis (GRA) method is typically effective for addressing MAGDM problems where the data is presented as numerical values. However, it struggles to handle spherical linguistic ambiguity in MAGDM scenarios. In this paper, we propose an approach that extends the classical GRA method by incorporating multiple objective optimization representations. In our In this method, we aggregate all individual matrices using the Spherical Linguistic Fuzzy Coquettish Integral Weighted Average (SLFCIWA) operator. [25]. Laser welded blanks (LWBs), also known as shaped blanks, are semi-finished components created Laser welding is the process of joining two sheets of the same or different materials (depending on the application), typically performed before the forming process. In body-in-white construction, Laser Welded Blanks (LWBs) provide several key advantages, including reduced weight, lower energy consumption, enhanced environmental sustainability, and improved dimensional stability. Laser beam welding is a fusion joining method that employs a laser to fuse two metal pieces together. [26]. Neutrosophic theory and its applications are progressing rapidly across various fields, particularly after the introduction of the journal *Neutrosophic Sets and Systems*. This progress has led to the swift development of new theories, techniques, and algorithms. A prominent trend in neutrosophic theory is the integration of neutrosophic sets with other structures, including coarse sets, dichotomous sets, soft sets, reluctant fuzzy sets, and others. In a short period, various hybrid systems have been proposed in the literature, including Coarse neutrosophic sets, single-valued neutrosophic systems combined with coarse sets, dichotomous neutrosophic sets, and single-valued neutrosophic hesitant fuzzy sets, among others. [27]. Within a specific range, as the number of groups increases, the angle generator in the group-by-group rotation module predicts additional angles, enabling the network to capture finer details of objects at different rotation orientations. Furthermore, increasing the number of groups does not lead to a significant rise in parameters or Flops. However, as the number of groups (n) increases further, the performance improvement becomes minimal. This could be because, when n is very large, each group is left with only a few kernels. In such situations, if the differences between the predicted angles for these groups are substantial, the limited number of kernels may not be adequate to effectively capture the features related to the rotation angles. [28]. The EDM process involves a wide range Input variable that can be controlled to process a specific material are essential. However, it is difficult to examine all the parameters of the EDM process during actual machining, and the testing time and associated costs rise as the number of input variables increases. The machining performance of the EDM process is strongly influenced by electrically controllable factors (such as peak current, pulse-on time, pulse-off time, polarization, and gap voltage) as well as electrically uncontrollable factors (including electrode material, dielectric type, dielectric pressure, and rotating electrodes). Other key factors include material removal rate, surface roughness, tool wear rate, and radial overcut. [29]. In this paper, the GRA method is expanded to address PL-MAGDM problems with incomplete weight information. First, we provide a brief review of the definitions of PLTs, the comparison method, and the distance measure The extended GRA method is applied to solve PL-MAGDM problems with incomplete weight information. We create several objective optimization models based on the traditional GRA method [30]. In certain real-life scenarios, decision makers or experts may lack accurate or sufficient knowledge about the problem or may struggle to clearly differentiate the degree to which one alternative is better than another. Typically, multivariate group decision problems involve Uncertain and imprecise data are addressed by solving multivariate group decision problems within the framework of interval-valued Pythagorean fuzzy sets, using the Coquet integral. The key advantage of the Coquet integral is its alignment with the Lebesgue integral when the measure is additive. [31]. Amanas et al. An algorithm was proposed to address multi-attribute decision-making problems for combatants, where attribute weights are provided as precise numerical values and attribute values are represented by intuitively fuzzy numbers. Li11 explored multi-attribute decision-making with intuitively fuzzy information, developing several linear programming models to determine the optimal attribute weights. Using the maximum deviation method and the intuitively fuzzy weighted average operator, Wei1 studied the MADM problem, where attribute values are expressed as intuitively fuzzy numbers, and there is incomplete information regarding the attribute weights. [32]. Gray correlation analysis (GRA), a prominent branch of gray system theory, focuses on evaluating the closeness between series based In the geometric form of their curves, the main approach is to convert the observed values of individual system behaviors into piecewise continuous lines through linear interpolation, and then create models to assess the degree of correlation based on the geometric characteristics of these lines. Building on the GRA model introduced by Professor Deng Haling, numerous scholars have conducted significant research on the construction and properties of GRA models, yielding many valuable findings [33]. In this paper, we introduce an extended fuzzy GRA method for solving MCDM problems, where the criterion values are expressed as linguistic variables in the form of interval-valued triangular fuzzy numbers, and the criterion weights are unknown. To determine the criterion weights, we develop optimization models based on the fundamental principles of traditional GRA. The computational steps of the extended GRA method for MCDM are then outlined, utilizing interval-valued triangular fuzzy estimators to rank the alternatives and identify the most preferred one. The paper is structured as follows: Section. [34]. In this paper, we propose a solution to address the ranking inconsistency in

a GRA-based network selection algorithm. We analyze the algorithm to identify the root cause of the issue and prevent the occurrence of rank inversion effects. Our findings indicate that adjusting the normalization method can effectively reduce or eliminate rank inversion. To validate our theoretical assumptions, we assess the performance of the proposed solutions. [35]. The main objective of this research paper is to validate the GRA method, enhance the gray system, and evaluate the best alternative under conditions of imprecise data. Throughout the study, several important questions arose, prompting us to delve deeper into managing the decision-making problem more effectively, which encouraged the continuation of the current research. [36]. Riemannian optimization is a relatively recent approach to constrained optimization that leverages full information about the underlying geometry of the control set to develop optimization algorithms. This method is especially effective when the underlying structures are defined by differential geometry, such as the Lévy-Cavit connection and geodesics. It is commonly applied in fields like signal processing and numerical linear algebra, where optimization naturally occurs on homogeneous spaces, such as Stegall or Grumman manifolds. In this paper, we present a new class of Newton algorithms. Grumman manifolds and explore their applications in eigenvalue and invariant subspace computations [37].

3. ANALYSIS AND DISCUSSION

TABLE 1. Consumer banking

	Customer Satisfaction	Digital Banking and Technology	Financial Products and Services	Customer Support
Online Banks (Nedbank's)	12.34	111.24	76.23	7.98
Credit Unions	56.78	223.56	23.78	50.39
Peer-to-Peer (P2P) Lending	90.15	785.09	56.78	55.77
Fintech Solutions	23.54	678.14	23.65	12.98
Cryptocurrency and Decentralized Finance (Deify)	67.89	556.42	87.90	33.67

The data in Table 1 highlights consumer satisfaction across various banking platforms, focusing on key areas such as digital technology, financial products and customer support. Peer-to-peer (P2P) lending dominates digital banking, with a significant score of 785.09, demonstrating its technological edge. In contrast, traditional credit unions lead in customer satisfaction (56.78) and customer support (50.39), reflecting their personalized service. Cryptocurrency and decentralized finance (Deify) excel in financial products (87.90), indicating innovation in investment options. Meanwhile, finch solutions and online banks lag behind in satisfaction and support, highlighting areas that need improvement. The high disparities suggest that consumer preferences and technological demands are improving.

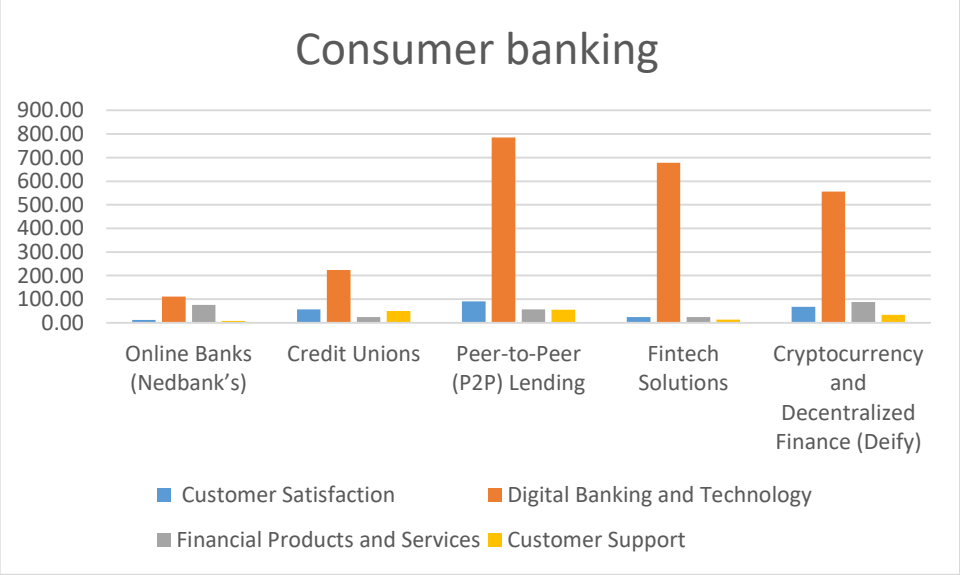

FIGURE 1. Consumer banking

Figure 1. Consumer banking exhibits extreme variations in performance. Peer-to-peer (P2P) lending leads digital banking (785.09), while cryptocurrency financial products excel (87.90). Credit unions dominate in customer satisfaction (56.78) and support (50.39). In contrast, online banks show weaknesses across the metrics, highlighting stark variations in innovation, service, and consumer priorities.

TABLE 2. Normalized Data

	Customer Satisfaction	Digital Banking and Technology	Financial Products and Services	Customer Support
Online Banks (Nedbank's)	0.0000	0.0000	0.1816	1.0000
Credit Unions	0.5711	0.1667	0.9980	0.1126
Peer-to-Peer (P2P) Lending	1.0000	1.0000	0.4844	0.0000
Fintech Solutions	0.1439	0.8413	1.0000	0.8954
Cryptocurrency and Decentralized Finance (Deify)	0.7139	0.6607	0.0000	0.4624

Table 2 Provides normalized data for consumer banking performance using the GRA method, showing excessive disparities across categories. Peer-to-peer (P2P) lending increases customer satisfaction (1.0000) and digital banking (1.0000), but decreases to zero in customer support. Fintech solutions excel in financial products (1.0000) and maintain strong customer support (0.8954). Credit unions are leaders in financial services (0.9980) but lag behind in technology (0.1667). Cryptocurrency performs moderately in most categories, except for financial products (0.0000). However, online banks struggle significantly, showing poor performance in all areas except customer support (1.0000). These differences reflect excessive discrepancies in priorities and service strategies.

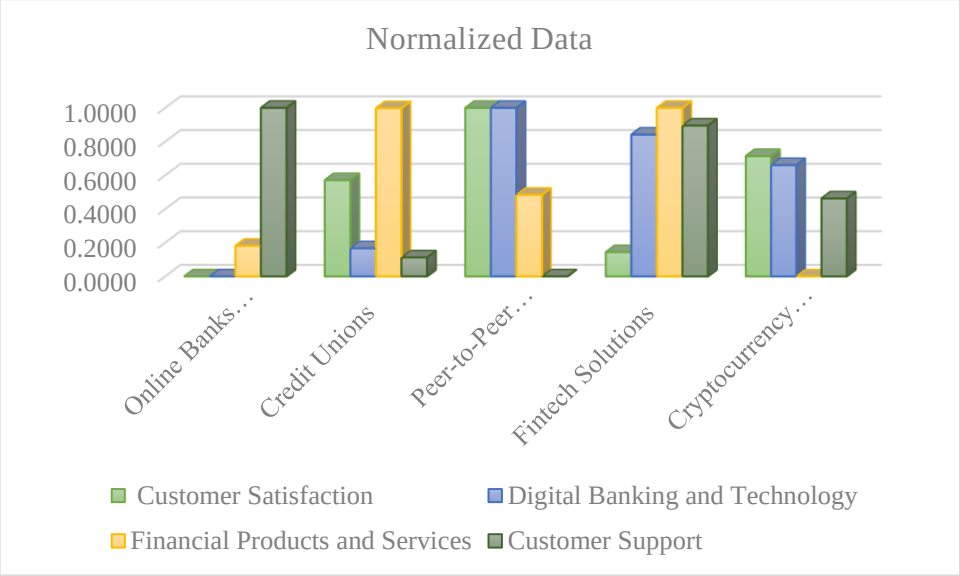

FIGURE 2. Normalization Data

Figure 2. Normalized consumer banking data illustrates the excess variance. Peer-to-peer (P2P) lending excels in satisfaction (1.0000) and technology (1.0000), but scores zero in support. Fintech solutions lead the way in financial products (1.0000), with strong support (0.8954). Online banks struggle overall, with their only strong support (1.0000).

TABLE 3. Deviation sequence

	Customer Satisfaction	Digital Banking and Technology	Financial Products and Services	Customer Support
Online Banks (Nedbank's)	1.0000	1.0000	0.8184	0.0000
Credit Unions	0.4289	0.8333	0.0020	0.8874
Peer-to-Peer (P2P) Lending	0.0000	0.0000	0.5156	1.0000
Fintech Solutions	0.8561	0.1587	0.0000	0.1046
Cryptocurrency and Decentralized Finance (Deify)	0.2861	0.3393	1.0000	0.5376

Table 3. Shows the order of deviation in consumer banking performance using the GRA method. Peer-to-peer (P2P) lending shows the least deviation in customer satisfaction (0.0000) and technology (0.0000), but peaks in customer support (1.0000). Fintech solutions show the smallest deviation in financial products (0.0000), but struggles with satisfaction (0.8561). Cryptocurrency fluctuates significantly in financial products (1.0000) but maintains balanced performance elsewhere. Credit unions show the least deviation in financial products (0.0020) but has the highest variance in others areas. Online banks exhibit substantial deviation in satisfaction (1.0000) and technology (1.0000), emphasizing intemperate service imbalances.

TABLE 4. Gray Correlation Coefficients

	Customer Satisfaction	Digital Banking and Technology	Financial Products and Services	Customer Support
Online Banks (Nedbank's)	0.3333	0.3333	0.3793	1.0000
Credit Unions	0.5383	0.3750	0.9960	0.3604
Peer-to-Peer (P2P) Lending	1.0000	1.0000	0.4923	0.3333
Fintech Solutions	0.3687	0.7591	1.0000	0.8270
Cryptocurrency and Decentralized Finance (Deify)	0.6361	0.5957	0.3333	0.4819

Table 4 shows the Gray correlation coefficients (GRA method), which highlight the excessive variation in consumer banking metrics. Peer-to-peer (P2P) lending leads in customer satisfaction (1.0000) and technology (1.0000) but lags in support (0.3333). Fintech solutions dominate financial products (1.0000) with strong customer support (0.8270), although lags in satisfaction (0.3687). Cryptocurrency performs moderately across metrics but struggles in financial products (0.3333). Credit unions excel in financial products (0.9960) but show inconsistency in technology (0.3750). Online banks score low in most categories except customer support (1.0000). These inter-industry differences reveal the varying strengths and weaknesses of the sector.

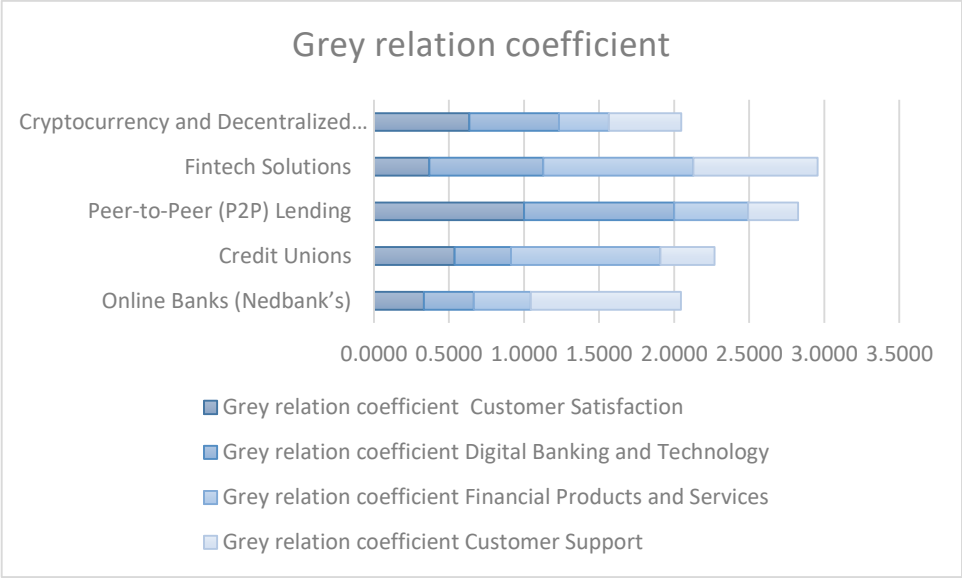

FIGURE 3. Grey relation coefficient

Figure 3 illustrates the excessive variation in Gray correlation coefficients across consumer banking metrics. Peer-to-peer (P2P) lending excels in satisfaction (1.0000) and technology (1.0000), but falters in support (0.3333). Fintech solutions lead the way in financial products (1.0000) with strong support (0.8270). Onlineanks how strength only in support (1.0000).

TABLE 5. GRG Ranking Results

	GRG	**Rank**
Online Banks (Nedbank's)	0.5115	5
Credit Unions	0.5674	3
Peer-to-Peer (P2P) Lending	0.7064	2
Fintech Solutions	0.7387	1
Cryptocurrency and Decentralized Finance (Deify)	0.5117	4

Table 5 presents the final Grey Relationship Grades (GRG) and rankings, which show significant variations in consumer banking performance. Fintech solutions maintain a high ranking (GRG: 0.7387) due to their balanced strength across the metrics. Peer-to-peer (P2P) lending follows closely (GRG: 0.7064), excelling in satisfaction and technology. Credit unions are in third place (GRG: 0.5674), supported by strong financial products. Cryptocurrency and decentralized finance (Deify) shows moderate performance (GRG: 0.5117), ranking fourth.

Online banks lag behind (GRG: 0.5115), reflecting significant gaps in their offerings. These disparities underscore the intense competition within the sector and the diverse consumer preferences that shape its design.

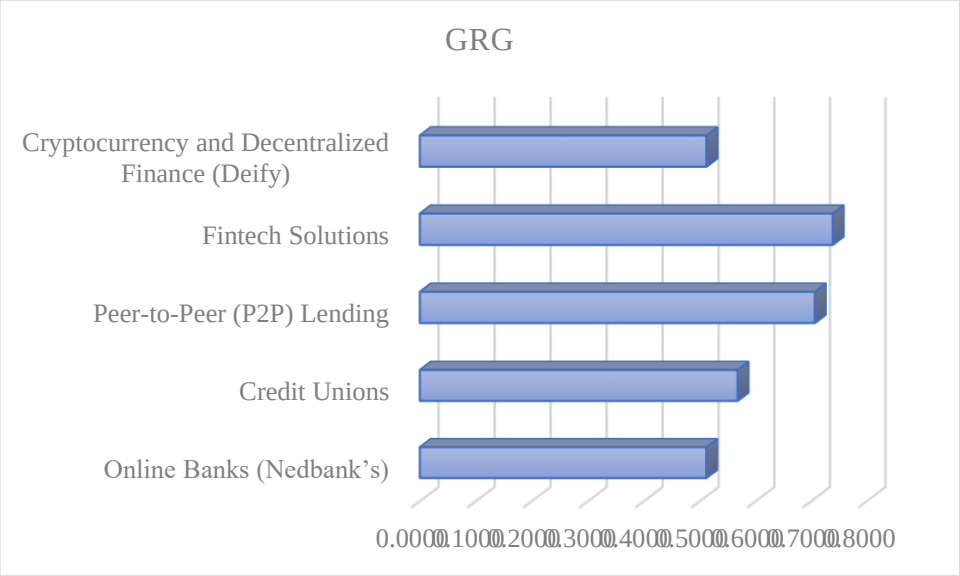

FIGURE 4. GRG

Figure 4. Gray Relationship Grades (GRG) highlights the excessive variations in rankings. Fintech solutions are the top performer for the chart (0.7387), followed by P2P lending (0.7064). Credit unions are third (0.5674), showing moderate performance. Cryptocurrency (0.5117) and online banks (0.5115) reflect significant gaps in trajectory, competitiveness, and consumer value.

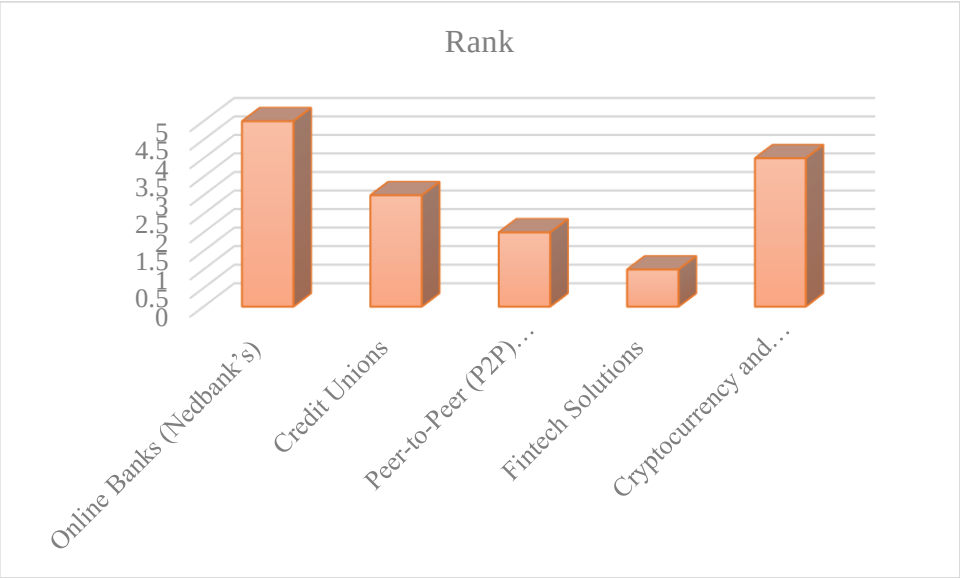

FIGURE 5. Display of Ranking

Figure 5 depicts the extreme imbalances in rankings based on Gray Relationship Grades (GRG). Fintech solutions take the top spot (0.7387), followed by P2P lending (0.7064), demonstrating dominance in innovation and services. Credit unions secure third place (0.5674), while cryptocurrency (0.5117) and online banks (0.5115) struggle at the bottom.

4. CONCLUSION

The Grey Relational Analysis (GRA) of consumer banking platforms offers valuable insights into the evolving dynamics of the financial services industry. Fintech platforms have emerged as the clear frontrunners, achieving

the highest Grey Relational Grade (GRG: 0.7387) due to their strong performance in areas such as financial product diversity and customer support, highlighting the effectiveness of combining technological innovation with user-friendly service delivery. Closely following are P2P lending platforms (GRG: 0.7064), which emphasize the growing influence of digital innovation in banking, excelling in customer satisfaction and advanced digital banking features, though with some limitations in support services. Traditional banking models, particularly credit unions (GRG: 0.5674), still hold relevance by offering community-focused value propositions, yet they lag behind in digital competitiveness. In contrast, conventional online banks (GRG: 0.5115) demonstrate that an online presence alone is insufficient without innovation and customer engagement. Meanwhile, emerging platforms based on cryptocurrency and decentralized finance (GRG: 0.5117) show promise but remain hindered by evolving service models and adoption barriers. The analysis underscores that future success in consumer banking hinges on an integrated approach that balances digital innovation, comprehensive financial offerings, dependable customer service, and high satisfaction. Institutions that aim to thrive must move beyond isolated strengths and work towards holistic, customer-centric platforms, while also learning from competitors to address performance gaps across key service dimensions.

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