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# Banking Service Evaluation in the Digital Age: A Comprehensive Analysis Using the VIKOR Method

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ABSTRACT

*This study uses the VIKOR methodology to evaluate and rank various banking options, focusing on core banking features, digital capabilities, business-specific services, and value-added services. The research analyses five distinct banking types: digital-only banks, traditional credit unions, and online business banking platforms, specialty banks, and crypto banking solutions. Through a systematic evaluation using the VIKOR methodology, which is designed to address decision-making problems across multiple criteria, the study provides detailed rankings and this assessment highlights the varying strengths and weaknesses of each banking option. Specialty banks stand out, ranking first due to their strong overall performance. Traditional credit unions, in second place, perform well in business-oriented services but are weak in other areas. Despite their moderate scores, crypto banking solutions, with significant weaknesses in digital capabilities, are in third place. Online business banking platforms are in fourth place, benefiting from value-added services but lacking in other important aspects. Although strong in digital capabilities, digital-only banks are in fifth place, with significant weaknesses in business-oriented and value-added services, making them the least competitive option.*

*The results reveal that specialty banks rank highest with a Qj value of 1, showing superior performance across multiple criteria. Traditional credit unions come in second place (Qj = 0.716478), followed by crypto banking solutions (Qj = 0.673956), online business banking platforms (Qj = 0.551683), and digital-only banks (Qj = 0). In particular, while digital-only banks excel in digital capabilities, their overall rankings indicate limitations in other key areas, particularly value-added services. The findings highlight that success in the banking industry requires a balanced approach that combines traditional banking strengths with modern capabilities. The study provides valuable insights for businesses selecting banking partners and for banking institutions developing strategic plans.*

*Furthermore, the research demonstrates the effectiveness of the VIKOR methodology in evaluating complex banking options, providing a structured approach to decision-making in the financial sector. These results contribute to understanding the evolving banking landscape and the importance of comprehensive service offerings in meeting diverse business needs.*



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## Introduction

With the rapidly growing computer and telecommunications industries, and competition intensifying daily, performance measurement and benchmarking serve as essential tools for continuous improvement. These activities drive business units to continuously adapt and improve their operations to remain competitive and succeed in the global competitive marketplace.A single measure is rarely sufficient to assess performance. While individual performance measures can reveal

specific gaps, integrating multiple measures into a final assessment remains a complex challenge.Therefore, benchmarking models capable of managing multiple performance metrics and providing a unified benchmarking metric are needed [1]. Business processes that rely heavily on information technology have emerged as prime candidates for


BPO. One sector that has undergone significant change in this regard an example One such sector is banking, where business processes such as Business resolution and execution control are now managed by IT systems. This led to an examination of the factors that influence or inhibit the decision to adopt a BPO, resulting in the development of a model that incorporates multiple BPO decision criteria. Our analysis

focused specifically on two key factors: the risks and benefits perceived by senior management regarding BPO [2]. This regulatory feature has raised concerns among academics and policymakers because it could increase pro-cyclical behaviour by banks, especially in an imperfect market for bank capital. During an economic downturn, if credit risk models downgrade bank borrowers, minimum capital requirements for banks will rise accordingly.If raising external capital becomes challenging or expensive during an economic downturn, simultaneous fluctuations Changes, potentially intensifying the early economic downturn [3]. It is essential to ensure that this contribution is not hampered by limitations in key inputs such as management and labour skills, financial resources, and business infrastructure.This paper examines the financing of SMEs and explores opportunities to improve this process. Following a brief overview of the importance of SMEs in the UK, it analyses the barriers affecting access to finance, with a particular focus on the reasons behind the lack of finance. The study highlights the important role of information and communication between businesses and finance providers. Finally, it discusses how fostering a virtuous cycle of improved information flow and communication can improve SME financing [4]. As financial institutions worldwide become more globalized and internationalized, trading activities within the financial sector are expanding.

The market structure is becoming increasingly complex due to the diversity and innovation of available products. As a result, the risk associated with investing in financial institutions is also increasing.Given these changes in the economic environment, banks can no longer function as mere money intermediaries. To thrive under these conditions, they now need to explore a variety of investment opportunities. However, banks driven by the goal of maximizing profits are likely to increase their investments in higher-risk products or expand their foreign exchange trading. This approach masks the higher risks associated with high profits, thus increasing the likelihood of a bank failing due to poor management [5]. The banking industry has undergone significant changes in recent decades, while presenting challenges to bank managers in maintaining profitability in an increasingly competitive environment as the inevitable forces of

technological innovation and globalization create growth opportunities.Other factors that have hindered research so far include inadequate description of the econometric methodology used in the study and/or failure to account for certain aspects of bank profitability. This suggests that the estimates derived from these studies may be biased or inconsistent.The project involved several objectives such as defining the software architecture, creating algorithms, and leveraging AWS cloud features such as Amazon MQ, AWS App Comfit, AWS Elastic Beanstalk, AWS Cloud Formation, and AWS Glue. Additionally, the project involved creating frameworks, interfaces, design patterns, and test automation solutions that were maintainable, scalable, extensible, and followed industry best practices. As the Technology Lead, I was responsible for overseeing a cross-functional team of engineers, designers, and QA professionals, ensuring that our ambitious goals were successfully achieved [6]. It excludes any intangible elements that do not contribute to the future capability of the organization. In this context, intellectual capital includes the expertise, experience, and skills that foster relationships within and outside the organization. It is characterized by linkages and complementarities, meaning that the productivity of one resource can be improved by investing in others.

The banking sector has undergone significant changes over the past decade, driven by both structural and technological developments, which are Forcing top management to re-evaluate their business strategies, financial globalization, fierce Competition, developments in information and communication technology, deregulation and re-regulation are key factors in this transformation [7]. Electronic banking has evolved into a global phenomenon, serving as an essential and powerful tool for promoting growth, supporting development, fostering innovation and increasing competitiveness. Technological innovations play a key role in shaping the delivery these electronic channels of banking these are collectively known as electronic banking. In developed countries, electronic banking or online banking has become an integral part of the economy. Electronic banking is a service that enables the transfer of funds between financial institutions through electronic signals instead of relying on Cash, checks, or other negotiable instruments [8]. Banks represent a subset of the larger financial services industry.

A bank institution is also defined as an organization that provides money management services, handles transactions related to customers' accounts and portfolios, and reports on a daily basis.The banking system in India needs to be user-friendly and adaptable to the challenges presented by technology and various External and internal factors. Over the last thirty years, the Indian banking system has made significant progress [9]. Banks are highly heterogeneous, with significant variations in size, complexity, structure, operations, funding sources, and geographic presence. Understanding this diversity is critical because it helps to study, assess the effects of unconventional monetary policies and fiscal policy norms.And benchmark banks against relevant peer groups for supervisory purposes [10]. About a decade before the financial crisis, community banks, traditionally the primary lenders, began to lose their position as the preferred choice for fixed-term loans to small businesses seeking credit. The financial crisis accelerated these trends, creating a new post-crisis landscape for small business credit markets. In this article, we use Federal Reserve data to show that before the crisis, small businesses relied heavily on real estate as collateral for loans. During the crisis, lending from community banks declined. As the economy and housing markets began to recover, large banks used technology to compete for small business borrowers, seeking lending opportunities in a low-interest, low-return banking environment [11]. Digital technologies are advancing rapidly, leading to their widespread adoption in various organizational functions. Integrating artificial intelligence (AI) it is considered a best practice to integrate business process implementation or transformation. AI and machine learning (ML) technologies have the potential to fully replacing humans in specific tasks. In addition, artificial intelligence can perform certain functions significantly faster and more efficiently.

This underlines the importance of assessing consequences and impacts integrating AI into organizational operations. In this context, performance evaluation goes beyond mere economic performance indicators and includes optimizing the use of tools for the organization’s customers. As a result, implementing artificial intelligence should improve user satisfaction and encourage increased usage the services offered by companies, either directly or through the implementation of them [12]. Following the recent financial crisis, there is a growing body of real financial linkages in the literature, focusing on developing Dynamic stochastic general-equilibrium (DSGE) models that incorporate financial frictions on the demand and supply sides of credit markets. These models are a structural framework to analyse the behaviour of banks in transmitting and amplifying aggregate shocks, while also assessing the significance a key driver of business cycles.

This approach helps to deepen Understanding the role of the banking sector macroeconomic fluctuations.This paper presents a micro-structured framework that includes the active banking sector, including the interbank market and banks subject to capital requirements, in a DSGE model with financial accelerators based on the BGG approach. Unlike previous

studies that include bank capital to address the moral hazard problem between households and banks, this paper introduces bank capital to meet the prescribed capital requirements. External regulatory authorities [13]. A strong argument has been made for an "online-only" business model in the banking industry, which eliminates the need for a physical presence. By eliminating the infrastructure of branches, banks can reduce overhead costs, which can be passed on to customers through lower fees or better services. Lower lending rates or higher deposit rates, which help attract new customers without sacrificing revenue [14]. In this evolving environment, banks need to be aware of and prepare for many dynamic changes. A strategic plan is essential for progress, helping each retail bank shape its own future based on its strengths, weaknesses, and limitations.

Every economic decision comes with its own set of challenges, especially when an agent needs to identify the optimal combination of choice variables by considering the relationships between these variables and the resulting benefits.As a result, Banks are less embedded in their customers' daily routines, while other businesses are more focused on banking operations and identifying potential market gaps for themselves. From this, we gain a key insight that banking is no longer primarily looking for relevance in the economy. Instead, the focus is on providing improved service is very important because Better service will inevitably result in more sales. An economic agent like a bank provides services[15]. In response to their own capital shortages, small banks reduced their loan portfolios significantly more than large banks. On the other hand, large banks often increased lending when small banks faced greater capital pressures. The dollar-for-dollar devaluation of their loans had a significant impact on economic activity.The decline in the debt of large banks, creating "more powerful loans" in small banks [16].

**Materials And Method**

**Digital-only banks:** A digital-only bank offers banking services only Delivering basic services in a direct manner through digital internet. Using electronic means, documents, real-time data and automated processes. A digital bank encompasses a virtual process that includes online banking, mobile banking, and more. As a comprehensive platform, digital banking consists of a front end visible to consumers, a back end accessible to bankers through servers and control panels, and the middleware that connects these components.

**Traditional credit unions:** Credit unions are all non-profit organizations focused on prioritizing the well-being of their members. These banks serve the public, offering services such as checking and savings accounts, loans, mortgage services, and financial and overdraft protection. In addition, they typically offer credit card services and foreign currency exchange services.

**Online business banking platforms:** Online banking, also Internet banking, also referred to as internet banking, web banking, virtual banking, or home banking, is a system that allows customers of a bank or financial institution to perform various financial transactions through the company's website or mobile app, or "BOB", is a web-based financial management system offered by a bank that allows companies to access their accounts and certain electronic services online.

**Specialty industry banks:** This is a broad term that encompasses a variety of key strategies, all of which share the common feature of providing collateralized loans to non-bank financial businesses. As a result, the special fund is often referred to as asset-backed funds or private asset-backed securities (ABS).A specialized bank is one that engages in banking activities aimed at the growth and development of a specific sector of the economy. **Crypto banking solutions:** A crypto a bank is a financial institution that provides services, for example loans similar to traditional banks, but uses crypto currency instead of traditional currencies like dollars.For example, a credit union could provide block chain-based loans, which enables direct interactions between borrowers and lenders.

**Key banking features:** The key feature of mobile banking is the ability to make various payments directly through mobile banking apps. For example, you can set up billers and pay utility bills, repay loan EMIs, recharge your mobile and DTH services, and pay credit card dues.Banking services primarily involve accepting deposits, granting loans, facilitating transactions, and providing financial Products like savings accounts, loans, and credit cards. Banks are essential to the economy by supporting liquidity and enabling economic activity.

**Digital capabilities:** Digital skills are the knowledge, understanding and abilities that allow individuals to live, learn and work in a digital society relies on them to help it use various technologies efficiently and appropriately in different contexts and settings. skills will foster more engaging and interactive learning experiences, which will lead to increased student engagement and improved learning outcomes.

**Business-specific services:** Business services include all services that support an organization without producing or delivering physical goods. These services provide benefits such as cost savings, improved efficiency, and improved employee productivity.Professional or business services include digital marketing companies, legal practices, accounting services, and small business management. Transportation services include ride-sharing, taxis, airlines, and buses. Home services include lawn care, plumbing, HVAC, and more.

**Value-added services:** Value-added services are services that go beyond traditional banking services add value. Banks incorporate these services into their offerings, forming the core of their offerings to differentiate themselves from competitors and make traditional banking services more attractive.Value-

added services are additional features that a business offers along with a standard product or service. While a company markets and sells a specific product or service, it can enhance its offerings in many ways and provide more value to its customers. customers. customers.

**VIKOR Method**

In this study, VIKOR was systematically selected for selecting an agile concept in a case study. The VIKOR algorithm, proposed by Obrikovic and Cheng, is used in the research. The ability to evaluate and choose between various alternatives, considering conflicting criteria, is a key advantage of VIKOR. Furthermore, it provides a solution that is acceptable to decision makers by maximizing Group use for the "majority" and minimizing personal discomfort for the "opponent". In this case, the company's decision makers are tasked with selecting the best agile concept to implement from a set of agile criteria [17]. Multiple decision makers are involved In evaluating candidates, it is clear that employee selection is a type of MCDM problem, each decision-maker in this expresses preferences among available candidates, who are evaluated on the basis of multiple, often [18].

For example, Chang and Hsu used the VIKOR method to select the most effective constrained strategies for the Cheng-Wen watershed, while Chen and Wang used VIKOR involving fuzzy logic to select partners for IT outsourcing projects. Sanai et al. and Shemshadi et al. developed two unique linguistically based fuzzy VIKOR algorithms for supplier selection. In addition, Devi used fuzzy VIKOR to solve a robot selection problem.for material handling [19]. This study presents a clear approach to determine the best outcome for employee performance appraisal in conjunction with the vision and mission of the organization to identify individuals who can make the most significant contribution to the organization's progress in the context of work activities, promotions require individuals to demonstrate exemplary behaviour and act as role models.

A decision that will increase importance in the promotion process will yield the best outcome. For comparison, the VIKOR method is used to generate index rankings multiple alternatives. The VIKOR method structurally adjusts the modelling hierarchy compared For AHP, AHP is seen as a method for evaluating decision solutions evaluation method. The VIKOR method presents a significant challenge by generating rankings through a series of cooperative rankings based on the index levels completed using the AHP method [20]. The literature review reveals that only limited research has been done aimed at improving the FMEA evaluation method for assessing maintenance importance, overcoming Disadvantages of traditional FMEA [21]. VIKOR is a multi-criteria decision-making model used to establish priority rankings among various alternatives. When there are Conflicting criteria. The central concept of VIKOR revolves around the use of compromise programming to establish priority rankings based on Personal and collective regrets. However, VIKOR faces a significant challenge in obtaining priority rankings of alternatives, which will be addressed later [23]. However, when evaluating Alternatives are evaluated based on multiple criteria, which leads to issues such as criterion weights, preference bias, and conflicts between criteria, which complicates the problem decision-making process more complex. More advanced methods are needed to effectively address these challenges.The field of decision-making explores multiple criteria how decision makers can perform better when faced with multiple conflicting criteria. [24].

In today's business world, the term 'ergonomics' is widely recognized. However, despite its familiarity, many business professionals are unaware of its significance. In manufacturing industries, especially in developing countries, it is crucial to raise awareness about ergonomics. Generally, a manufacturing sector is made up the workplace consists of six essential elements: tasks, environment, management, human operators, and equipment. Failure to provide ergonomically designed working conditions can lead to problems such as back pain, neck pain, finger numbness, and depression [25]. Kaya and Karajan introduced a new method by combining the fuzzy modified VIKOR with AHP. When the VIKOR method is most effective decision making, there is very little research investigating its application in the context of linguistic hesitation intuitionistic ambiguity.

This paper extends the VIKOR method by incorporating a linguistically A, where performance evaluation values expressed as linguistic terms with intuitionistic ally ambiguous elements [26]. To achieve this, we need to identify several criteria that managers can use when making decisions about the development of an IMS. The Analytical a hierarchical process can be used to determine the dimensions, criteria, and weights of various components indicators), and by using (F-VIKOR), we can take the analysis a step further to determine the final rankings of the alternatives, bringing us closer to an optimal solution.The use of F-VIKOR methods offers several advantages, including simplicity, rationality, ease of understanding, and robust computational capability, allowing the comparative performance of alternatives to be directly measured using a simple mathematical approach. This study contributes by providing new insights into ISO standards and GRI, particularly in assessing their suitability as.By uncovering new insights involving significant sub-criteria, AHP results

serve as a foundation for decision makers and researchers to identify key and less important criteria. Further contributions arise from the use of the F-VIKOR method, which extends previous findings and assists in prioritizing the best alternatives to improve and verify the consistency of the results [27]. First, we define an evaluation index for selecting a logistics service provider. The interdependencies between the criteria are usually determined through group expert discussions. After establishing the criterion network structure, the weights for each criterion can be calculated using the ANP method, which reflects the subjective opinions of the decision maker. Finally, the VIKOR algorithm is used to generate the final ranking results. Each step is explained in detail in the following subsections [28]. When evaluating mobile services, VIKOR offers several advantages over other MCDM methods. During the selection process, customers typically eliminate It is necessary to filter out Mobile services with unsatisfactory characteristics are downgraded at the initial screening stage. [29]. in this approach, initially, a new set of criteria is established and then fuzzy mathematics is applied. Then, the VIKOR method is used to assess the quality of online health information providers. Each step of Fuzzy VIKOR method is briefly described, followed by a numerical example with the four leading online sources for diabetes information. This example demonstrates how this technique can effectively rank health-related information providers across various health topics [30].

**Analysis And Discussion**

**Table 1.** Determination of best and worst value ofBusiness Banking using VIKOR method

| | Key banking features | Digital capabilities | Business-specific services | Value-added services |
|---|---|---|---|---|
| Digital-only banks | 8 | 11 | 7 | 1 |
| Traditional credit unions | 9 | 10 | 6 | 12 |
| Online business banking platforms | 2 | 9 | 0 | 8 |
| Specialty industry banks | 10 | 3 | 1 | 6 |
| Crypto banking solutions | 8 | 1 | 4 | 3 |
| Best | 2 | 11 | 7 | 1 |
| Worst | 10 | 1 | 0 | 12 |

Table 1 provides an assessment of various commercial banking options using the VIKOR method, comparing core banking features, digital capabilities, business-specific services, and value-added services. Digital-only banks show the best performance in digital capabilities (11) but the lowest score in value-added services (1). Traditional credit unions perform strongly in business-specific services (12), while online commercial banking platforms are rated poorly across all categories. Specialty banks excel in core banking features (10) but lag behind in digital capabilities (3). Crypto banking solutions show low scores in most areas, especially in digital capabilities (1).

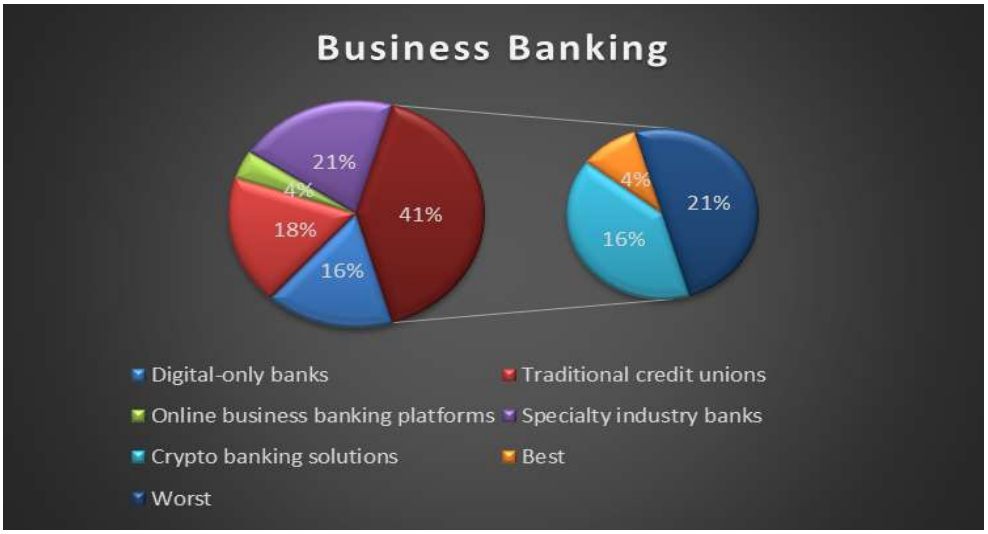

**Figure 1**. Determination of best and worst value of Business Banking

Figure 1 illustrates the evaluation of business banking options using the VIKOR method, showing key banking features, digital capabilities, business-specific services, and value-added services. Digital-only banks lead in digital capabilities but score very low in value-added services. Traditional credit unions excel in business-specific services, while online platforms do not perform well in all areas.

**Table 2**. Calculation Sj and Rj

| | Key banking features | Digital capabilities | Business-specific services | Value-added services | Sj | Rj |
|---|---|---|---|---|---|---|
| Digital-only banks | 0.1875 | 0 | 0 | 0 | 0.1875 | 0.1875 |
| Traditional credit unions | 0.21875 | 0.025 | 0.035714 | 0.25 | 0.529464 | 0.25 |
| Online business banking platforms | 0 | 0.05 | 0.25 | 0.159091 | 0.459091 | 0.25 |
| Specialty industry banks | 0.25 | 0.2 | 0.214286 | 0.113636 | 0.777922 | 0.25 |
| Crypto banking solutions | 0.1875 | 0.25 | 0.107143 | 0.045455 | 0.590097 | 0.25 |

Table 2 presents the calculation of Sj and Rj using the VIKOR method, assessing core bank features, digital capabilities, business-oriented services, and value-added services. For each bank category, Sj and Rj values are calculated based on their performance in these categories. Digital-only banks have the lowest Sj and Rj values, indicating relatively low performance across features. Traditional credit unions show moderate values for Sj and Rj, especially in business-oriented services. Online business banking platforms rank high in value-added services, but have moderate scores overall. Specialty banks show high performance in business-oriented services, which is reflected in their high Sj and Rj values. Crypto banking solutions, while scoring low in value-added services, show good performance in other areas.

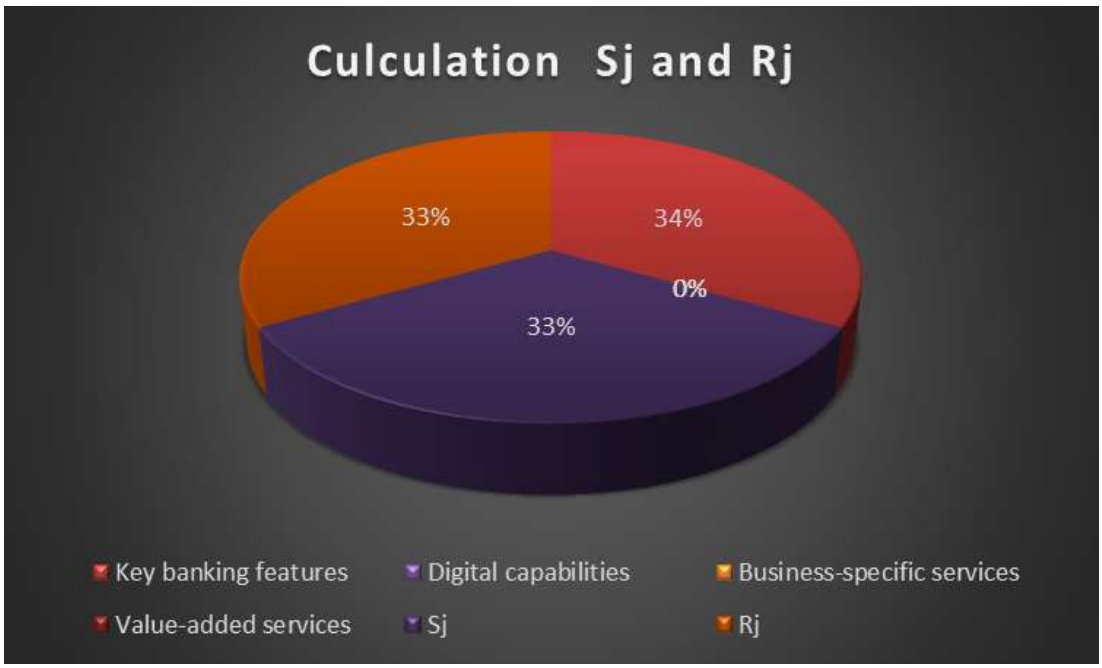


**Figure 2**. Calculation Sj, Rj

Figure 2 shows the calculation of Sj and Rj values using the VIKOR method, evaluating bank preferences across key features. Digital-only banks have the lowest values for both Sj and Rj. Traditional credit unions and online commercial banking platforms show moderate values, while specialty banks score high, indicating strong performance.

**TABLE 3.** Final Result of Calculation Qj

| | Sj | Rj | Qj | Rank |
|---|---|---|---|---|
| Digital-only banks | 0.375 | 0.1875 | 0 | 5 |
| Traditional credit unions | 1.029464 | 0.529464 | 0.716478 | 2 |
| Online business banking platforms | 0.868182 | 0.459091 | 0.551683 | 4 |
| Specialty industry banks | 1.141558 | 0.777922 | 1 | 1 |
| Crypto banking solutions | 0.885552 | 0.590097 | 0.673956 | 3 |

Table 3 presents the final results of the Qj calculation using the VIKOR method, where the Sj and Rj values together determine the ranking. The Qj values reflect the overall performance of each banking option. Special sector banks rank highest with a Qj value of 1, demonstrating their strong performance across all categories. Traditional credit unions are in second place with a Qj value of 0.716478. Crypto banking solutions and online merchant banking platforms show similar Qj values, placing them in third and fourth place, respectively. Digital-only banks are in last place with a Qj value of 0, indicating weak overall performance.

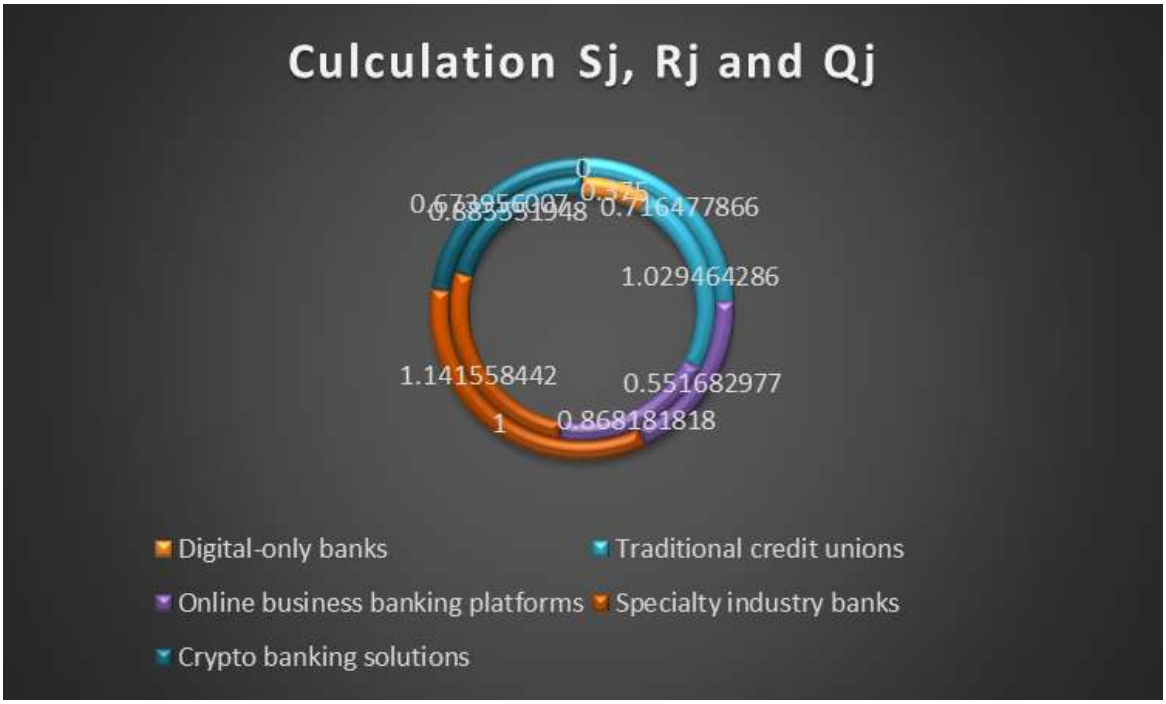


**Figure 3**.Calculation Sj, Rj and Qj

Figure 3 shows the final results of the Qj calculation using the VIKOR method, which indicates the ranking of the different banking options. Special sector banks take the top spot with the highest Qj value of 1, while traditional credit unions are in second place. Digital-only banks are ranked the lowest, reflecting their weak overall performance.

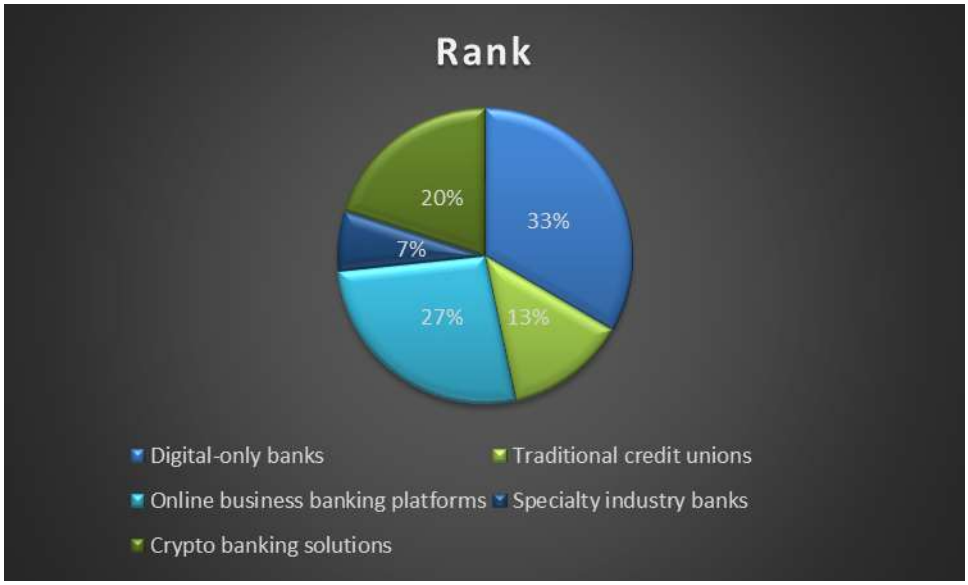


**Figure 4.** Shown the Rank

Figure 4 illustrates the ranking of various banking options using the VIKOR method. Specialty sector banks lead the way at number 1, followed by traditional credit unions in second place. Crypto banking solutions are in third place, online commercial banking platforms are in fourth place, and digital-only banks are ranked lowest, at number five.

## Conculsion

The study used the VIKOR methodology to evaluate and rank various banking options based on a number of criteria, including core banking features, digital capabilities, business-oriented services, and value-added services. The analysis revealed several notable findings that provide valuable insights into the current banking landscape.

Specialty banks emerged as the top choice with the highest Qj value of 1, demonstrating their superior performance across multiple criteria. This indicates that their focused approach and specialized services provide the most consistent and effective banking solution. Traditional credit unions came in second place with a Qj value of 0.716478, highlighting their strong commitment to member services and competitive offerings, particularly business-oriented services.Crypto banking solutions came in third place with a Qj value of 0.673956, showing promise despite being relatively new entrants into the banking industry. While they may lack some of the traditional banking features, their innovative approach positions them as a viable alternative for specific business needs. Online business banking platforms ranked fourth with a Qj value of 0.551683, indicating room for improvement in their service offerings and capabilities.Surprisingly, digital-only banks, despite their strong performance in digital capabilities, ranked last with a Qj value of 0. This indicates that while technical competence is important, it is not enough to meet comprehensive banking needs. The low ranking suggests that digital-only banks need to strengthen their value-added services and business-specific offerings to become more competitive.

These findings underscore the importance of a balanced approach in banking services, where institutions need to combine traditional banking strengths with modern capabilities to meet diverse business needs. The success of specialty banks demonstrates that focused expertise combined with comprehensive service offerings is a winning strategy in the banking industry. This analysis provides valuable guidance to businesses in selecting banking partners, as well as to banking institutions in strategic planning and service development.

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