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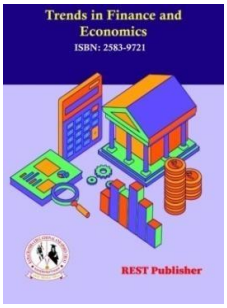

An Analysis on the Performance of Electronic Payments Systems in India Using the TOPSIS Method

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Abstract: *In recent years, India's electronic payment systems have undergone a substantial expansion and transformation. Digital payments are now more common in the nation because to a number of government programmers and technology developments. This introduction gives a summary of how well India's electronic payment systems perform while underlining the major elements that have contributed to their success. The implementation of programmers like demonetization in 2016, which aimed to lessen the reliance on physical currency and boost digital transactions, has expedited India's transition to a cashless economy. Economic Impact: A nation's economy is greatly influenced by the use of electronic payment systems. Examining their success in India offers information about the development and uptake of digital transactions, the transition to a cashless society, and the effects on financial inclusion. Such study aids informing financial policy and strategy decisions by regulators, economists, and industry professionals about the economic effects of electronic payments. Financial Inclusion: A key element of inclusive economic development is access to financial services and goods. Examining how electronic payment systems operate in India can help determine how effective they are at promoting financial inclusion, especially for underprivileged people. Targeted actions and legislative changes to close the financial gap can result from an understanding of the challenges and opportunities associated with digital payments. The process for examining the effectiveness of electronic payment systems in India might include a number of processes and research techniques. Here is a recommended approach. Decide on a clear study objective, such as assessing the effectiveness, uptake, or effects of electronic payment systems in India. Gather pertinent "data from a variety of sources, such as government reports, business magazines, academic journals, and financial organizations". Data can contain user demographics, transaction volumes, values, trends, and technological infrastructure. "E-payment systems, ATM, Mobile Money, Net Banking, Credit (Debit)card". "Reliability, Ease of use, Responsiveness. Security, Usefulness, Cost". Mobile Money achieves the highest rank of 1, followed by ATM at rank 2, Credit (Debit) card at rank 3, and Internet Banking at rank 4. Mobile Money achieves the highest rank of 1, followed by ATM at rank 2, Credit (Debit) card at rank 3, and Internet Banking at rank 4.by using TOPSIS method we obtained ranks for the performance of e payments system in India.*

Keywords: *TOPSIS, e payments, ATM, demonetization*

1. INTRODUCTION

Electronic Cheque, Online Electronic Money System, Online MasterCard Payment, and Cards-based e-Payment System are some of the different types of e-payment systems that can be categorised. For both sellers and buyers, each system has benefits and drawbacks. New payment methods are becoming more popular due to factors including simplicity, affordability, security, traceability, anonymity, acceptability, and control. In order to stay competitive in the fast-paced industry, banks play a vital role in assisting e-commerce and e-payment systems. Despite having a reputation for being a cash-based country, India has adopted e-payment services in the banking and retail industries. An essential supporter of any economy is the financial system. Reliability and openness are crucial traits to manage the growing amount of financial transactions. The financial system in this article includes both banks and non-bank financial institutions that offer their clients financial services. Fund transfer and financial clearance are two of the many services provided by the payment system that are regarded as being essential. The payment system is essential for fostering sector reforms, increasing financial transparency, and supporting corporate growth.[1]A sort of interorganizational information system (IOS) for financial transactions, connecting several associations and individual clients, is known as an electronic payment system. In order to enable electronic

financial transactions, partners may need to connect in complex ways with the aid of banks and inter-switch houses. 19 offers a different perspective and defines an e-payment system as any form of online money transfer. On a similar line, as suggested by 20, a system of electronic payment alludes to an electronic way for paying for goods purchased through markets and shopping malls, the internet, or both. According to a different definition, e-payment systems are described as transactions where money is exchanged electronically.[2]Following the introduction of demonetization, the early chaos and uncertainty have given way to a rise in worries as the nation moves closer to a cashless society. The emphasis on online transactions raises concerns about whether it will result in convenience and considerable benefits or just add stress and extra costs. The Indian government's flagship effort, Digital India, intends to make the nation into a knowledge economy and society that is enabled by technology. The promotion of "anonymous, paperless, and cashless transactions is one of the main components of Digital India". "The government has provided a number of incentives and rewards for digital transactions" in an effort to promote the shift to a cashless economy. However, it's crucial to take into account whether these steps, along with other advantages, will sufficiently offset the elevated danger of identity theft once currency notes are once again made available for use. The digitization of the economy has both benefits and drawbacks. Let's examine what might be in store for you in more detail.[3]The Indian government is working hard to persuade poor and illiterate people living in rural areas to use Aadhaar Pay, a system that conducts financial transactions using fingerprints. This method of payment seeks to compete with card and internet purchases, which require users to enter a PIN and password. To enable cashless transactions, Aadhaar Pay needs that the merchant has the customer's Aadhaar number, the name of the bank, and their fingerprint. The programme, which only needs a finger biometric device to be attached, is compatible with any Android-based phones, regardless of their price, according to a report that was reported in the Times of India. Digital transactions are validated by this technology and PIN-less and card-less transactions can strengthen the security framework. Importantly, clients can do transactions without a smart phone. The government has instructed state banks to enlist 30–40 merchants per branch in order to promote cashless payments and introduce Aadhaar Pay to rural merchants in India. This initiative is anticipated to stimulate growth and innovation. The initial banks to offer "Aadhaar Pay services are Syndicate Bank, Andhra Bank, State Bank of India, IDFC Bank, and Industrial Development Bank". [4] Following the implementation of the demonetization legislation in India, a number of mobile payment service companies experienced considerable growth. The number of customers using these services increased as well, giving businesses a strong incentive to draw in more customers of all ages to adopt mobile payment technologies and lessen their dependency on cash transactions. E-wallets were introduced by well-known mobile payment companies in India, including Paytm, Freecharge, Mobikwik, and ICICI Pockets. This provided new features including money transfers, cinema ticket booking, online shopping, and even the ability to use wallet services as bank accounts (as with Paytm Bank), in addition to simplifying mobile payment operations. The company was one of the early pioneers in the Indian sector. Even telecom firms like Airtel and Reliance launched their own payment services, dubbed Airtel Payments Bank and JioMoney, in reaction to the remarkable response to these digital wallets. Although there was a 6.05 percent growth in digital transactions in India in 2017, it's crucial to remember that this number includes a variety of digital payment methods, including "credit and debit cards, NEFT (National Electronic Funds Transfer), mobile payments, and others".[5] The development of payment and settlement systems in India relies heavily on "the Reserve Bank of India (RBI), which encompasses both high-value and low-value transactions". In the 1980s, the central bank took the initiative to modernize the outdated paper-based clearing system by introducing automation. During the 1990s, the RBI introduced "electronic clearing services, including ECS Credit and Debit, as well as electronic funds transfer systems". To replace "the Special Electronic Fund Transfer (SEFT) system" introduced in April 2003, "the National Electronic Fund Transfer (NEFT) system" was launched in November 2005. Additionally, the RBI introduced "the real-time gross settlement (RTGS) system" in March 2004. The paper-based interbank clearing system was replaced with the RTGS system, which is run by the RBI and manages a sizable amount of high-value and urgent customer transactions. Additionally, the RBI manages paper-based and electronic clearing operations at clearinghouses located in 17 major cities, where it also serves as the settlement banker.[6]A study by Fiallos and Wu indicates that the development of the internet has resulted in a large increase in electronic payments and transactions. At first, customers would make transactions online and send their credit card data across the network in an unencrypted format, posing security and privacy hazards. But when people's privacy and security concerns increased, a variety of secure network payment techniques were created. According to Fiallos and Wu (2005), digital money has significant advantages for banks, financial institutions, and online retailers. It is a form of electronic payment that combines the adaptability of paper money with the security standards required for online transactions. In a similar study on secure electronic currency systems, Lee et al. (2003) highlighted how such systems can guarantee the anonymity of legitimate users while keeping traceability to combat problems like money laundering or illegitimate cash issuance. The anonymity of digital money might be revoked in instances of criminal behaviour to safeguard the bank. It can also prevent illicit material copying and distribution by adding tracing content features into the digital cash payment mechanism, assuring adherence to copyright rules. Digital money can help industries like digital entertainment since it makes product distribution simpler and safer. Additionally, digital money makes it possible to track those responsible for the unauthorised

copyrighted work replication and distribution, improving author protection and reducing revenue loss for digital media entertainment organisations.[7]As part of India's Digital India programme, the digitalization of payment systems represents an important step towards the establishment of a Faceless, Paperless, and Cashless economy. A number of variables, such as the Digital India programme itself, a favourable regulatory environment, innovative payment services, and enhanced consumer experiences, are what are driving the rise of digital payment systems in India. "A platform for knowledge-based electronic transformation in governance, comprising both the central and state governments", has been built by the Digital India programme. The three main areas of the program's focus are delivering infrastructure as a utility to "all citizens, providing government and services on demand, and giving individuals digital empowermen"t. This programme has been significant in fostering digital financial inclusion and integrating the unbanked into the economy. "The Pradhan Mantri Jan Dhan Yojana (PMJDY), the Unified Payment Interface (UPI), and the 2016 demonetization policy" are further key reasons that have boosted digital transactions. The Indian government's main programme, the PMJDY, aims to ensure that every citizen has a bank account by promoting financial inclusion. These accounts act as the standard method for the government to pay account holders via Direct Benefit Transfer (DBT). "A platform for knowledge-based electronic transformation in governance, comprising both the central and state governments, has been built by the Digital India programme". The three main areas of the program's focus are delivering infrastructure as a utility to all citizens, providing government and services on demand, and giving individuals digital empowerment. This programme has been significant in fostering digital financial inclusion and integrating the unbanked into the economy.[8] India has made significant strides in the use of contemporary technology within its financial services sector in recent years. The RBI has worked to create one of the most cutting-edge payment and settlement systems in the world as the only custodian of the payment system in India. The Real-Time Gross Settlement (RTGS) system, which uses real-time internet-based fund transfers, is one of the systems the RBI introduced. Instantaneous money transfers are possible using RTGS. The terms "real-time" and "gross settlement" underline the fact that each money transfer instruction is resolved separately while "real-time" suggests that instructions are executed right away after being received [9]. Mobile payments, e-wallets, electronic payments, and QR-based payments are only a few examples of the various payment methods assisted by digital tools that fall under the category of "digital payments" (Alkhowaiter, 2020; Chaveesuk et al., 2021a; Musyaffi et al., 2021). These payment options have expanded quickly in the Asian region, especially since the Covid-19 outbreak. According to data, public expenditure on online shopping is rising by 30–40%, while contactless payments are increasing by about 60% (McKinsey & Company, 2020). This expansion has benefited the financial sector in Asia, which now wants to maintain it during the post-pandemic period [10]. As useful tools in this regard, online biller platforms, UPI (Unified Payments Interface), and e-wallet apps have emerged. In order to make it simple for customers to pay their bills, set up automatic payments, and manage transactions, several banks have incorporated their payment services within their online banking platforms. sites like PayTM and PhonePe offer fee payment choices on their sites for those who are uneasy with these services. In order to stop the pandemic from spreading further, Mandar Agashe, co-founder and senior chairman of Sarvatra Technologies, a provider of payment solutions, claims that more steps must be taken in India. Offline payments should be avoided in light of the current situation, and digital payment systems like UPI, IMPS, RTGS, mobile wallets, and online banking can be crucial in minimising human interaction and assuring safer transactions [11].

2. MATERIALS & METHODS

E-payment systems: Convenience and accessibility: E-payment systems give consumers the freedom to conduct transactions whenever and wherever they want, without having to be physically present or carry currency. Users can begin payments through websites, mobile apps, or other digital platforms, which makes it simpler and more accessible for both consumers and companies. Security and Fraud Prevention: To safeguard user data and stop fraudulent actions, e-payment systems use strong security features including encryption, tokenization, and multi-factor authentication. These systems frequently offer a risk-free substitute for conventional currency transactions, lowering the possibility of theft and unauthorised access to financial data.

ATM: Convenience and accessibility: E-payment systems give consumers the freedom to conduct transactions whenever and wherever they want, without having to be physically present or carry currency. Users can begin payments through websites, mobile apps, or other digital platforms, which makes it simpler and more accessible for both consumers and companies.Security and Fraud Prevention: To safeguard user data and stop fraudulent actions, e-payment systems use strong security features including encryption, tokenization, and multi-factor authentication. These systems frequently offer a risk-free substitute for conventional currency transactions, lowering the possibility of theft and unauthorised access to financial data.

MOBILE MONEY: Financial Inclusion: Mobile money, especially in areas with a dearth of traditional banking facilities, has significantly contributed to financial inclusion. It enables people to carry out fundamental financial transactions including sending and receiving money, making payments, and saving money for those who previously had access to formal financial institutions. Cell wallets, which are virtual accounts connected to a user's

cell number, are frequently used in mobile money transactions. These wallets enable users to safely carry out a variety of transactions and keep money online.

Credit (Debit)card: Convenient Methods for Making Payments: Credit and debit cards offer a practical way to make payments. Instead of carrying cash or writing cheques, customers can simply swipe, insert, or tap their cards at point-of-sale terminals to complete transactions. In contrast, credit cards offer a line of credit from the bank that issued them, allowing users to make purchases on credit up to a predetermined limit.

Reliability: Consistent Performance: Reliability ensures that a system or service consistently performs its intended function without unexpected interruptions or failures. Users rely on the consistent operation of various technologies, such as electronic payment systems or online platforms, to carry out their daily activities without disruptions. Dependability and Trustworthiness: Reliability instills trust and confidence in users. When a system or service consistently operates as expected, users can depend on it to deliver the intended results and fulfill their needs. Reliability builds trust between users and providers, fostering long-term relationships and customer satisfaction.

Ease of use: Designing user interfaces that are simple and straightforward is a key component of ease of use. Positive user experiences are facilitated by simple layouts, logically organised features and actions, and intuitive iconography and labelling. Products and services with a low learning curve require little training and experience to utilise. Without substantial training or technical understanding, users should be able to immediately comprehend how to interact with the system and complete required activities.

Responsiveness: Prompt Feedback: Responsive systems respond quickly to user interactions and give users timely feedback on their activities. This entails responding to user input, showing loading messages as data is processed, and giving real-time updates on system health or development. Quick Loading Times: Being responsive means reducing the time it takes for online pages, applications, or services to load. Users may become frustrated and leave a website due to slow loading speeds. In order to ensure that users can access and engage with content quickly, responsive systems optimise performance and reduce latency.

Security: Data protection: "Security measures are put in place to protect sensitive data, such as private financial information, personal information, or corporate information". Data confidentiality and integrity are helped by encryption, access controls, and secure communication protocols, which help prevent unauthorized access. User Authentication: To confirm a user's identity, strong user authentication mechanisms are utilised, such as passwords, biometrics, or two-factor authentication. This ensures that only authorised users can carry out particular tasks or access sensitive information, preventing unauthorised users from accessing systems or services.

Usefulness: Meeting User Needs: The usefulness of a product or service is based on how well it satisfies the unique requirements and objectives of its target audience. It should offer functionality and features that meet the needs and expectations of users, resolving their issues or achieving their goals. Usefulness is closely tied to the utility or practical value that a good or service provides to its customers. It should simplify activities, boost productivity, or enhance the user experience overall. It should also offer measurable advantages. A helpful product or service offers value and improves usability for its users.

Cost: Price Consideration: Users analyse a product or service's affordability and value for money; hence price is an important factor in decision-making processes. Users take into account both the initial purchase price and continuing expenses including licencing fees, maintenance charges, and prospective upgrade costs.Return on Investment (ROI): By assessing the possible return on investment, consumers determine if a good or service is cost-effective. They assess if the value offered justifies the expense incurred by comparing the gains made to the financial investment. A good ROI can increase the user appeal of a product or service.

3. TOPSIS Method

In order to solve problems involving "Multiple Criteria Decision Making (MCDM), the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method is frequently utilised" [2, 3]. It is useful for a variety of real-world situations, such as reviewing financial ratios within a certain industry, comparing firm performances, and analysing financial investments in modern manufacturing systems [4, 5]. However, TOPSIS is not without its drawbacks. Enhancing the weight sensitivity of the R value has been the main goal of earlier research to improve the original TOPSIS approach [6, 7]. The methodology for determining the R value has also advanced, thanks to innovations like the "Miqiezhi" approach [8]. There is a need for a simpler and more efficient technique "to understand the fundamental connection between the R value and alternative evaluation due to the complexity of evaluation difficulties". "The modified TOPSIS (M-TOPSIS) method is a revolutionary strategy that is presented in this research". In order to assess the quality of alternatives, it entails figuring out how far reference points and alternatives are from one another in the D+ D- plane. By providing a simpler and improved method to handle MCDM problems, the M-TOPSIS method seeks to increase understanding of the assessment process.[1] The current equation for converting objective criteria is unable to guarantee consistency between the language ratings of subjective criteria and the values of the objective criteria. The converted values and the fuzzy numbers defined within the [0,1] range may then have compatibility problems. The translation of A3 using Liang and Wang's direct connection equation, for instance, yields values that lie outside the [0,1] range, "resulting in incompatibility when

three alternatives (A1, A2, and A3)" are evaluated under a benefit criterion with precise values. Their inverse relationship equation raises the same problem.[2] Considering the multiplication of two positive triangular fuzzy numbers, it is inaccurate to perceive the result as another triangular fuzzy number. However, there is a possibility that this assumption may not hold true in all cases. To accurately represent the multiplication, additional development of the membership function is required. Liang and Wang propose an approach that involves a ranking strategy incorporating the maximising set and minimising set to address this issue. However, the presented information does not go into specific detail or usefulness of this rating approach. [3, 4] Fuzzy MCDM issues are also now covered by the TOPSIS approach. Different strategies have been put forth by researchers to use TOPSIS to address fuzzy MCDM. Fuzzy integrals are used by Chen and Tzeng (2004) to convert a fuzzy MCDM problem into a nonfuzzy MCDM problem, and grey relation grade is used to specify the relative proximity of each choice. Chu (2002a, 2002b) and Chu and Lin (2003) use the TOPSIS method to turn a fuzzy MCDM problem into a crisp one and solve it. They use interval arithmetics of fuzzy numbers to create membership functions of weighted ratings, which they then defuzzify into crisp values using the mean of method [5]. The ratings of alternatives and the weights of criteria are true values in traditional TOPSIS. This traditional approach has been effectively used in a number of domains, and the literature extensively discusses these uses However, in some circumstances, particularly when taking into account imprecise criteria, it can be difficult to exactly determine the real values of the ratings of alternatives. The ratings are shown as fuzzy values in these circumstances. Although TOPSIS has been extended to address fuzzy decision-making issues, these additions frequently have drawbacks. For instance, ideal solutions are frequently presented as real values rather than fuzzy values, while ideal solutions that might not be possible in the decision matrix are represented as fuzzy values [1, 5, 6, 32, 23, 55]. [6] It is feasible to collect ground-truth findings for comparison in classification problems, which aids in assessing how well various strategies perform. With MCDM, we only have access to ratings or assessments of candidate alternatives, and both the normalisation methodology used and the MCDM method have an impact on these ratings. In order to give a "thorough evaluation of the objects in terms of the multidimensional economic phenomena under examination, TOPSIS takes into account both the proximity to the positive ideal solution and the distance from the negative ideal solution". This strategy enables decision-makers to evaluate the effectiveness or performance of numerous items or alternatives based on multiple factors at once. It allows for item comparisons and ranking based on relative performance, taking into consideration all pertinent determinants or variables [8]. The best possible values for each criterion are included in the positive ideal solution, while the lowest possible values are included in the negative ideal solution.In the TOPSIS technique, a decision matrix is built using the scores or ratings given to each alternative for each criterion. Then, this matrix is normalised to take into account variations in scale or measurement units amongst criteria. The distances between each choice and the positive and negative ideal solutions are computed using the normalised decision matrix [9]. "A multiple attribute decision-making (MADM) problem" is seen by TOPSIS as a geometric system made up of points that represent different options in an n-dimensional space. By measuring "the distance between an alternative and the positive-ideal solution, which represents the best possible values for each criterion, and the negative-ideal solution", which represents the worst possible values for each criterion, the approach seeks to identify the alternative with the shortest distance to the positive-ideal solution. To identify the most advantageous option, an index termed similarity to the positive-ideal solution and remoteness from the negative-ideal solution are calculated.[10]

4. RESULT AND DISCUSSION

TABLE 1. The performance of electronic payments systems in India

E-payment systems	Reliability	Ease of use	Responsiveness	Security	Usefulness	Cost
ATM	0.18013	0.55775108	0.664347171	0.71335	0.88674107	0.69
Mobile Money	0.8727008	0.8386292	0.600870327	0.86929	0.70385438	0.79
Internet Banking	0.1714775	0.30389468	0.646527914	0.18925	0.12255385	0.6
Credit (Debit) card	0.3822203	0.61924963	0.540735922	0.63942	0.43196782	0.38

The performance of different electronic payment systems in India is depicted in Table 1. Evaluation of these systems is conducted using criteria like reliability, ease of use, responsiveness, security, usefulness, and cost. Each system's performance is measured on a scale of 0 to 1, where higher values signify superior performance. These scores serve as an indication of the systems' performance across the evaluated criteria, with higher scores implying better performance in the specific categories.

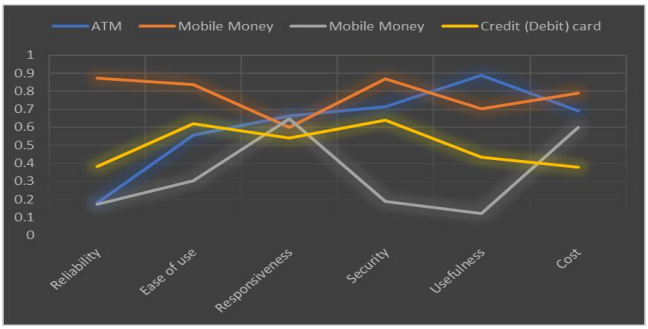

TABLE 1. The performance of electronic payments systems in India

The performance of different electronic payment systems in India is depicted in Figure 1. Evaluation of these systems is conducted using criteria such as reliability, ease of use, responsiveness, security, usefulness, and cost. Each system's performance is measured on a scale of 0 to 1, where higher values signify superior performance. These scores offer insights into the performance of each payment system across the evaluated criteria, with higher scores indicating better performance in the respective categories.

TABLE 2. Normalized Data

0.182937	0.456896	0.540138	0.545637	0.728076	0.548894
0.886299	0.686984	0.488529	0.664917	0.577914	0.623027
0.174149	0.248943	0.525651	0.144753	0.100625	0.470887
0.388176	0.507274	0.439638	0.489093	0.354676	0.298025

Table 2 presents the normalized data derived from the TOPSIS method for evaluating the performance of electronic payment systems. Criteria such as reliability, ease of use, responsiveness, security, usefulness, and cost are utilized for assessment. The data is normalized on a scale of 0 to 1 to enable meaningful comparisons. The TOPSIS method enables a comparative evaluation of the payment systems' performance based on the normalized data, with higher values indicating superior performance in the respective categories. This analysis aids in identifying the relative strengths and weaknesses of each payment system across the evaluated criteria.

TABLE 3. Weightages

0.166	0.166	0.166	0.166	0.166	0.166
0.166	0.166	0.166	0.166	0.166	0.166
0.166	0.166	0.166	0.166	0.166	0.166
0.166	0.166	0.166	0.166	0.166	0.166

Table 3 illustrates the weightages allocated to individual criteria when evaluating electronic payment systems. These weightages determine the relative importance of each criterion within the overall assessment. Each criterion is assigned a weight of 0.166 (equivalent to 1/6) for all payment systems. This indicates that all criteria hold equal significance, contributing one-sixth (0.166) of the total assessment weight for every electronic payment system listed in the table.

TABLE 4. Weighted normalized decision matrix.

0.030367	0.075845	0.089663	0.090576	0.120861	0.091116
0.147126	0.114039	0.081096	0.110376	0.095934	0.103423
0.028909	0.041325	0.087258	0.024029	0.016704	0.078167
0.064437	0.084207	0.07298	0.081189	0.058876	0.049472

Table 4 displays the weighted normalized decision matrix generated through the TOPSIS method for evaluating electronic payment systems. This matrix combines the normalized data from Table 2 with the weightages from Table 3, resulting in a comprehensive assessment of the systems. By integrating the importance of each criterion with the performance of each payment system, the weighted normalized decision matrix offers a holistic evaluation. Higher values in the matrix indicate better performance in the respective categories, taking into account both the normalized scores and the assigned weights.

TABLE 5. Positive Matrix

0.147125609	0.114039	0.089663	0.110376	0.120861	0.103423
0.147125609	0.114039	0.089663	0.110376	0.120861	0.103423
0.147125609	0.114039	0.089663	0.110376	0.120861	0.103423
0.147125609	0.114039	0.089663	0.110376	0.120861	0.103423

Table 5 displays the positive matrix derived from the TOPSIS method for evaluating electronic payment systems. This matrix illustrates the performance scores of each payment system across the assessed criteria. By presenting the performance scores, the positive matrix highlights the relative strengths of each system in the respective categories. Higher values in the matrix indicate better performance, signifying the systems' superior performance based on the TOPSIS evaluation.

TABLE 6. Negative Matrix

0.028909	0.041325	0.07298	0.024029	0.016704	0.049472
0.028909	0.041325	0.07298	0.024029	0.016704	0.049472
0.028909	0.041325	0.07298	0.024029	0.016704	0.049472
0.028909	0.041325	0.07298	0.024029	0.016704	0.049472

Table 6 displays the negative matrix derived from the TOPSIS method for evaluating electronic payment systems. This matrix presents the performance scores of each payment system in relation to each criterion, but with the scores inverted to reflect lower performance values. In the negative matrix, lower values indicate poorer performance in the respective categories. The negative matrix allows us to identify and assess the relative weaknesses of each payment system based on the TOPSIS evaluation.

TABLE 7. Values of Si Plus, Si Negative and Ci

E-payment systems	Si Plus	Si Negative	Ci
ATM	0.125039	0.13595388	0.52091
Mobile Money	0.026358	0.18966388	0.877984
Internet Banking	0.195476	0.03205111	0.140867
Credit (Debit) card	0.124941	0.09026088	0.419424

Table 7 presents the values of Si Plus, Si Negative, and Ci for different electronic payment systems, obtained through the TOPSIS method. Si Plus represents the distance of each system from the positive ideal solution, Si Negative represents the distance from the negative ideal solution, and Ci represents the relative closeness to the ideal solution. Here is a paraphrased summary of the values for each payment system: ATM: Si Plus (0.125039), Si Negative (0.13595388), Ci (0.52091) Mobile Money: Si Plus (0.026358), Si Negative (0.18966388), Ci (0.877984) Internet Banking: Si Plus (0.195476), Si Negative (0.03205111), Ci (0.140867) Credit (Debit) card: Si Plus (0.124941), Si Negative (0.09026088), Ci (0.419424) These values provide insights into the performance and relative closeness of each payment system to the ideal solution, allowing for a comparison of their overall effectiveness.

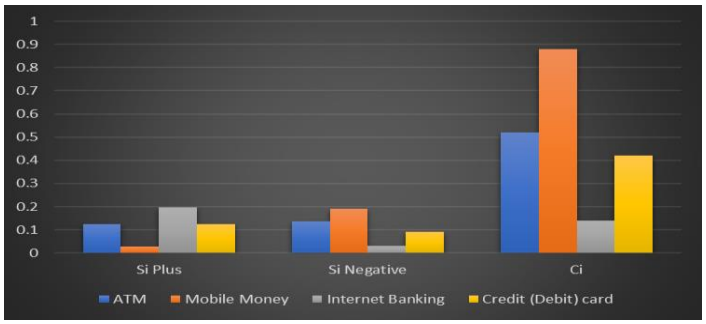

FIGURE 2. Values of Si Plus, Si Negative and Ci

Figure 2 presents the values of Si Plus, Si Negative, and Ci for different electronic payment systems, obtained using the TOPSIS method. Si Plus represents the distance from the positive ideal solution, Si Negative represents the distance from the negative ideal solution, and Ci represents the relative closeness to the ideal solution. Here's a summarized interpretation of the values for each payment system: ATM: Si Plus (0.125039), Si Negative (0.13595388), Ci (0.52091) Mobile Money: Si Plus (0.026358), Si Negative (0.18966388), Ci (0.877984) Internet Banking: Si Plus (0.195476), Si Negative (0.03205111), Ci (0.140867) Credit (Debit) card: Si Plus (0.124941), Si Negative (0.09026088), Ci (0.419424) These values provide insights into the performance and relative closeness of each payment system to the ideal solution, enabling a comparison of their overall effectiveness.

TABLE 8. Rank

E-payment systems	Rank
ATM	2
Mobile Money	1
Internet Banking	4
Credit (Debit) card	3

Table 8 displays the rankings assigned to various electronic payment systems using the TOPSIS method. These rankings reflect the relative performance of each system in the evaluation process. Mobile Money obtains the top rank of 1, followed by ATM at rank 2, Credit (Debit) card at rank 3, and Internet Banking at rank 4. The rankings offer an organized assessment of the payment systems based on their performance, as determined by the TOPSIS evaluation.

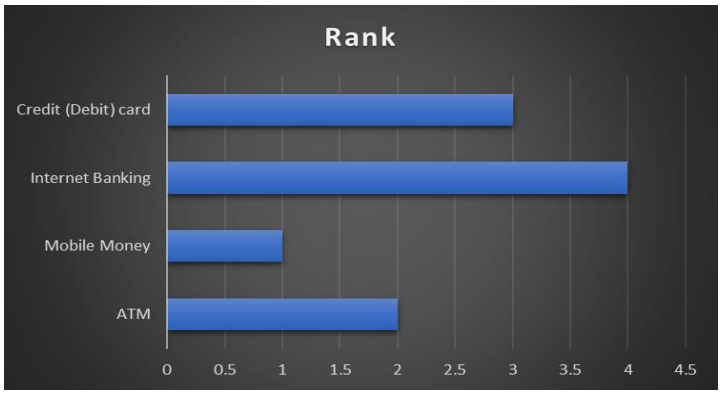

TABLE 8. Rank

Figure 3 presents the rankings assigned to different electronic payment systems using the TOPSIS method. These rankings indicate the relative performance of each system in the evaluation process. Mobile Money achieves the highest rank of 1, followed by ATM at rank 2, Credit (Debit) card at rank 3, and Internet Banking at rank 4. These rankings provide an organized assessment of the payment systems based on their performance, as determined by the TOPSIS evaluation.

5.CONCLUSION

In India, electronic payment systems have performed admirably. Due to initiatives like demonetization and the launch of the Unified Payments Interface (UPI), the acceptance of digital transactions in the nation has grown quickly. As a result, there has been a rise in financial inclusion, comfort, and transactional efficiency. Strong security measures have been put in place, which has improved client confidence and reduced the danger of fraud. A single ecosystem has been made possible via stakeholder cooperation and interoperability. Electronic payment systems in India have a bright future in influencing the financial landscape of the nation because to ongoing technological improves ends and rising digital literacy. N Rapid Development: The adoption of electronic payment methods has grown dramatically in India. This expansion has been significantly fueled by the deployment of programmes like demonetization and the Unified Payments Interface (UPI). Due to this, the quantity and value of digital transactions have increased, signalling a transition to a cashless economy.Financial Inclusion Has Increased: In India, electronic payment systems have been essential in fostering financial inclusion. For formerly unbanked communities, these platforms have made it simpler to obtain banking services and financial goods. Particularly in rural areas, mobile-based payment solutions like mobile wallets have developed as a practical and secure method of conducting transactions.

REFERNCES

1. Kumar, Atul. "A Study of Significant Characteristics of E-payment Regime in India." *MERC Global's International Journal of Management* 7 (2019): 168-174.
2. Masihuddin, Muddassir, Burhan Ul Islam Khan, M. M. U. I. Mattoo, and Rashidah F. Olanrewaju. "A survey on e-payment systems: elements, adoption, architecture, challenges and security concepts." *Indian Journal of Science and Technology* 10, no. 20 (2017): 1-19.
3. Sahu, G. P., and Naveen Kumar Singh. "Identifying Critical Success Factor (CSFs) for the adoption of digital payment systems: A study of Indian national banks." *Emerging Markets from a Multidisciplinary Perspective: Challenges, Opportunities and Research Agenda* (2018): 61-73.
4. Ali, Mostafa A., Nazimah Hussin, and Ibtihal A. Abed. "Electronic payment systems: Architecture, elements, challenges and security concepts: An overview." *Journal of Computational and Theoretical Nanoscience* 16, no. 11 (2019): 4826-4838.
5. Kanojia, Palak, and Madan Lal. "Impact of trust on customer adoption of digital payment systems." In *Impact of Mobile Payment Applications and Transfers on Business*, pp. 16-42. IGI Global, 2020.
6. Singhal, Rashi. "Impact and Importance of Digital Payment in India." *INTERNATIONALJOURNALOF MULTIDISCIPLINARYEDUCATIONALRESEARCH* 10, no. 2 (2021): 3.
7. Singh, Renu, and Garima Malik. "Impact of digitalization on Indian rural banking customer: with reference to payment systems." *Emerging Economy Studies* 5, no. 1 (2019): 31-41.

8. Gupta, Kanishk, and Nupur Arora. "Investigating consumer intention to accept mobile payment systems through unified theory of acceptance model: An Indian perspective." *South Asian Journal of Business Studies* (2020).
9. Patil, Pushp P., Yogesh K. Dwivedi, and Nripendra P. Rana. "Digital payments adoption: an analysis of literature." In *Digital Nations–Smart Cities, Innovation, and Sustainability: 16th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, I3E 2017, Delhi, India, November 21–23, 2017, Proceedings 16*, pp. 61-70. Springer International Publishing, 2017.
10. Gupta, Nitin, and Aditi Yadav. "The effect of electronic payment on customer satisfaction." *IJARIIE-ISSN (O)* 3, no. 3 (2017): 2395-4396.
11. Al-Sabaawi, Mohmed Y. Mohmed, Ali Abdulfattah Alshaher, and M. A. Alsalem. "User trends of electronic payment systems adoption in developing countries: an empirical analysis." *Journal of Science and Technology Policy Management* 14, no. 2 (2023): 246-270.
12. Kumaga, Delali. "The challenges of implementing electronic payment systems–The case of Ghana's E-zwich payment system." (2011).
13. Ranjith, P. V., Swati Kulkarni, and Aparna J. Varma. "A literature study of consumer perception towards digital payment mode in India." *Psychology and Education* 58, no. 1 (2021): 3304-3319.
14. Pavić, Zlatko, and Vedran Novoselac. "Notes on TOPSIS method." *International Journal of Research in Engineering and Science* 1, no. 2 (2013): 5-12.
15. Zavadskas, Edmundas Kazimieras, Abbas Mardani, Zenonas Turskis, Ahmad Jusoh, and Khalil MD Nor. "Development of TOPSIS method to solve complicated decision-making problems—An overview on developments from 2000 to 2015." *International Journal of Information Technology & Decision Making* 15, no. 03 (2016): 645-682.
16. Chu, T-C., and Y-C. Lin. "A fuzzy TOPSIS method for robot selection." *The International Journal of Advanced Manufacturing Technology* 21 (2003): 284-290.
17. Wang, Ying-Ming, and Taha MS Elhag. "Fuzzy TOPSIS method based on alpha level sets with an application to bridge risk assessment." *Expert systems with applications* 31, no. 2 (2006): 309-319.
18. Chu, T-C., and Y-C. Lin. "A fuzzy TOPSIS method for robot selection." *The International Journal of Advanced Manufacturing Technology* 21 (2003): 284-290.
19. Dymova, Ludmila, Pavel Sevastjanov, and Anna Tikhonenko. "An approach to generalization of fuzzy TOPSIS method." *Information Sciences* 238 (2013): 149-162.
20. Vafaei, Nazanin, Rita A. Ribeiro, and Luis M. Camarinha-Matos. "Data normalisation techniques in decision making: case study with TOPSIS method." *International journal of information and decision sciences* 10, no. 1 (2018): 19-38.
21. Balcerzak, Adam P., and Michal Bernard Pietrzak. *Application of TOPSIS method for analysis of sustainable development in European Union countries*. No. 22/2016. Institute of Economic Research Working Papers, 2016
22. Bhutia, Pema Wangchen, and Ruben Phipon. "Application of AHP and TOPSIS method for supplier selection problem." *IOSR Journal of Engineering* 2, no. 10 (2012): 43-50.
23. Karim, Rubayet, and C. L. Karmaker. "Machine selection by AHP and TOPSIS methods." *American Journal of Industrial Engineering* 4, no. 1 (2016): 7-13.
24. Sun, Chia-Chi, and Grace TR Lin. "Using fuzzy TOPSIS method for evaluating the competitive advantages of shopping websites." *Expert Systems with Applications* 36, no. 9 (2009): 11764-11771.
25. Huang, Jingwen. "Combining entropy weight and TOPSIS method for information system selection." In *2008 ieee conference on cybernetics and intelligent systems*, pp. 1281-1284. IEEE, 2008.
26. Li, Weishu, Liying Yu, Wenying Xia, Jian Zhou, YvXiu Zhao, and Mei Du. "Riding with the Surging Tide: A Review of MCDM's Evolution." *International Journal of Information Technology & Decision Making* 21, no. 03 (2022): 1087-1122.

