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Strategic assessment of fintech platforms in using fuzzy LMAW and fuzzy CRADIS methods

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Abstract: In a rapidly growing market like the Albanian one, FinTech platforms are playing an increasingly important role in transforming how financial transactions are conducted. The research aims to perform a strategic assessment of ten FinTech platforms currently operating in Albania based on 12 strategic criteria. The assessment is based on multi-criteria decision-making methods (MCDM). For this, a model based on the fuzzy approach was developed, allowing for the management of uncertainty and subjectivity in evaluating the performance and suitability of the platforms. Specifically, the fuzzy LMAW method was used to weight the criteria, with Security being assigned the highest weight. The ranking of the platforms was conducted using the fuzzy CRADIS method, with EasyPay achieving the best results. Through this model, the research seeks to provide an objective ranking of the platforms based on each criterion's relative contribution. The findings are expected to help developers, investors, and policymakers better understand the competitive positioning of current players. The results may also highlight areas for further improvement and growth in Albania's FinTech sector.

Keywords: *FinTech platforms, Fuzzy CRADIS, Fuzzy LMAW, MCDM.*

1. Introduction

The global economy has been transforming financial services in recent years. Financial technology (FinTech) is one of the most dynamic areas in the integration of traditional financial services with digital technologies [1]. FinTech offers a wide range of services, from mobile payments and personal finance management to digital investing, alternative lending, and automated insurance [2, 3]. The access of individuals and businesses to these financial services has also brought a paradigm shift in this digital revolution [4]. FinTech platforms offer greater accessibility, lower costs, transparency, personalization, and a better experience for consumers [5, 6]. FinTech platforms operate primarily in emerging markets and countries with weak financial infrastructure [7]. This may include countries that have limited access to traditional banking services. Albania is one of the countries experiencing gradual growth and is part of this global trend. The use and presence of FinTech platforms in Albania are

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undergoing a slow and steady transformation in the financial sector. FinTech platforms are emerging as the best alternatives to traditional banking services. This can include electronic payments, peer-to-peer transfers, digital wallets, and other digital payment methods. However, in the Albanian market, such financial platforms often face a series of challenges.

The lack of a complete regulatory framework, low consumer trust in new technologies, high levels of economic informality, and relatively low levels of financial education constitute limiting factors for the widespread spread of FinTech in the country [8]. Furthermore, there is a lack of a unified analysis for the strategic assessment in a structured, objective, and comparable manner of the performance of FinTech platforms in Albania. In this context, there is a need to systematically analyze the capacity, competitive advantages, and challenges of each FinTech platform operating in Albania. Furthermore, policymakers and relevant financial institutions must design credible digitalization and financial inclusion strategies [9]. Based on this, the research question guiding this research is: Which FinTech platform operating in Albania is the most reliable for use by consumers? Regarding the research question posed above, there is a need for an efficient assessment of the FinTech platforms operating in Albania. Multi-criteria decision-making (MCDM) methods are suitable for such an assessment. Also, the use of a fuzzy approach helps in dealing with the complexity and subjectivity during the assessment made by experts.

Therefore, the primary purpose of this research is to evaluate and strategically rank the ten most used FinTech platforms operating in Albania using fuzzy MCDM methods.

Based on the main objective, the research also addresses some specific objectives as follows:

- To select the most appropriate criteria for an efficient and fair assessment of the platforms selected for this research.
- Applying a methodology based on the combination of two decision-making methods to facilitate the transformation of qualitative assessments and provide an evidence-based ranking.
- Interpreting the final ranking of FinTech platforms involves analyzing the relative strengths and weaknesses of each platform, identifying the key factors that contribute to their development and improvement in the market.
- Providing the necessary practical recommendations for consumers, businesses, and stakeholders on ways to improve performance and support the development of FinTech platforms.

Based on the main objective and specific goals, this research aims to make several important contributions to the academic and practical literature:

- Implementation of a robust research methodology based on the combination of fuzzy LMAW and fuzzy CRADIS methods in the context of evaluating Fintech platforms in a developing economy like Albania.
- Construction of a clear and robust model that combines technical, legal, and perceptual aspects within an interactive evaluation framework.
- The research offers an opportunity for decision-makers to adopt a systematic and interconnected approach to improve service quality in FinTech platforms operating in Albania.

Furthermore, the model built in this research aims to provide a practical example of evaluation for developing sectors, where data collection and advanced analysis are more limited.

Ultimately, the research will provide policymakers with the necessary guidance to inform their policy decisions and foster a sustainable economy. Additionally, the findings of this research could help businesses that provide such financial services improve their standards.

The second section of this research deals with a literature review on FinTech platforms. Research gaps are part of this section. The third section discusses the methodology applied in this research. The model used and the fuzzy MCDM methods that were applied are discussed in the fourth section. The research results are presented in the fifth section. The research discussions are provided in the sixth section. The research concludes with conclusions and recommendations.

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2. Literature Review

FinTech is a well-known platform for providing financial services. FinTech enables the facilitation of complex operations in financial institutions to provide a better experience for consumers [10]. The evaluation of FinTech platforms is very important for consumers. Professional experience and security in financial services make a FinTech platform trustworthy for consumers. Therefore, the most transparent and adequate evaluation of the characteristics that identify a FinTech platform makes it the preferred choice for consumers. For this, Mohapatra et al. [11] identified 33 main factors and examined their importance for the adoption of FinTech. They applied an MCDM model based on the Gray Delphi method for factor reduction and the Fuzzy AHP method for prioritizing financial factors. Similarly, Nguyen [12] assessed the factors that most influence FinTech platforms in Vietnam. For this, he applied the CoCoSo and Interval-Valued Intuitionistic Fuzzy Set (IVIFS) methods.

On the other hand, the digital transformation that is taking root in financial institutions is exposed to various risks. Therefore, Yu [13] assessed FinTech institutions that could be in the spotlight. For this, he applied the fuzzy AHP method. Wibowo et al. [14] applied intuitionistic fuzzy numbers in evaluating the performance of FinTech platforms. Fintech, as a suitable platform for reducing costs and providing high-quality services to customers, requires continuous investigation into improving FinTech investments. For this, Kou et al. [15] evaluated the FinTech-based investments of European banking services. Based on the findings, they recommended that European banks adopt the strategy of FinTech platforms. This can make banks more accessible to customers and can help reduce costs. Kao et al. [16] applied MCDM methods in a fuzzy environment to evaluate the strategy that banks follow through FinTech for supply chain financing. According to the findings, banks can have sustainable development if supply chain financing is based on FinTech. Rjoub et al. [17] in their study investigated the FinTech factors that affect the performance of Chinese banks.

Wan et al. [18] analyzed a set of risks and strategic priorities of fintech lending for clean energy projects. They used a hybrid fuzzy MCDM methodology. Onsori et al. [19] applied a fuzzy approach to develop a predictive model for assessing strategic cooperation between the Iranian banking system and FinTech startups. From the findings, they noted that several key factors played an important role in strengthening the cooperation between banks and FinTech. Wang et al. [20] applied the fuzzy MCDM approach to assess the impact and potential of FinTech in several Southeast Asian countries. Thus, they assessed the levels of development in financial activities, technological infrastructure, and regulations that enable FinTech in these countries.

Rahadian et al. [21] analyzed the factors that affect FinTech competence for emerging markets such as Brazil, Russia, India, and China. The fuzzy approach was applied for this analysis, and it resulted that technological infrastructure plays the most important role in this regard [22]. The advancement of technology in financial systems is one part of this journey that is progressing at a galloping pace. On the other hand, financial education is one of the subsequent challenges in consumer behavior. The rapid development of technology has caused consumers to encounter problems in using this technology quite often. Therefore, in their study, Metawa et al. [23] applied the Neutrosophic-AHP approach and the Multi-Criteria Decision Analysis technique to evaluate the most important characteristics of FinTech platforms in the field of science education. Furthermore, Ding et al. [24] extended their study to the recruitment and identification of FinTech talents in China. They concluded that some of the most important indicators for FinTech talents were professional and learning skills, innovation and teamwork skills, project experience, and international vision.

Numerous studies have been conducted on FinTech, and the literature on this technology has been significantly enriched in recent years. This attention has mainly focused on markets or countries with developed economies, those with consolidated digital economies. In this context, Albania, as a developing country, lacks structured studies on the development and performance of FinTech platforms. Therefore, this represents a considerable scientific and theoretical gap for Albania. Based on the review of studies conducted in recent years on FinTech platforms, this research addresses the following research gaps:

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- The systematic evaluation of FinTech platforms based on well-defined multidimensional criteria constitutes a literature gap in the Albanian context. The use of the criteria selected in this research constitutes the basis for assessing the quality and potential for adaptation of FinTech platforms in the Albanian market.
- A comparative evaluation of FinTech platforms operating in the Albanian market is missing in the existing literature. This creates a significant research gap regarding how these platforms perform according to the perceptions of consumers and relevant experts.
- The application of a robust research methodology in decision-making based on multiple criteria constitutes another research gap in Albania. Furthermore, the evaluation of criteria under conditions of uncertainty and subjectivity in the evaluation of FinTech platforms deepens this deficiency. In this regard, the fuzzy SWARA and fuzzy CRADIS methods applied in this research offer an innovative approach in the evaluation of FinTech platforms in Albania.

Based on the identified gaps, this research aims to contribute to the scientific literature by providing a structured decision-making model for evaluating FinTech platforms in Albania. The research model was created by integrating the fuzzy LMAW and fuzzy CRADIS methods. The model developed in this study has not been used in any other research, making this work unique and innovative in the evaluation of FinTech platforms.

3. Methodology

The research for this paper was conducted in several phases. These phases include defining the subject and objectives of the research, selecting respondents, choosing criteria and alternatives, developing a questionnaire, collecting data, and finally implementing the MCDM method.

The initial phase of any research involves defining the subject and objectives. During this stage, it is important to establish the research goals and what the study aims to accomplish. Since the subject and objectives were outlined in the introduction of this paper, there is no need to repeat them here.

The second phase of the research involves selecting respondents for this study. In this phase, expert decision-making was chosen. The experts' task was first to identify the criteria and FinTech alternatives used in Albania, then to assess the importance of these criteria and evaluate how well these alternatives meet them. Selecting experts is a crucial step in evaluating FinTech platforms because it ensures a fair, efficient assessment by involving the right professionals. Since several state institutions oversee these platforms, the selection of experts was based on three key institutions responsible for supervision. The chosen experts have at least 10 years of work and academic experience. These institutions are the Ministry of Finance (MF), the Bank of Albania (BOA), and Agjencia Kombetare e Shoqerise se Informacionit (AKSHI). These organizations play a vital role in monitoring FinTech platforms. Therefore, four experts were from the MF and BOA because they regularly interact with these companies and are more familiar with their operations. As every service offered by FinTech platforms is computerized and involves technology, one expert was from AKSHI. Additionally, some of the criteria in this research are legal or social in nature, so two of the experts come from those fields. Two university professors from the University of Tirana, who study this area, were also included.

After selecting the experts for this research, the criteria were chosen collaboratively with them. The Delphi method was used to conduct the study. Initially, the experts were contacted to identify which criteria and FinTech alternatives should be included, based on their opinions. They then submitted proposals for both criteria and alternatives. These proposals were reviewed and re-evaluated to select the most important criteria and FinTech alternatives. After one iteration, the alternatives were finalized, and after three iterations, the criteria and alternatives used in this research were determined. In total, 12 criteria and 10 FinTech alternatives were selected. The criteria were based on previous research (Table 1), while the FinTech platforms are those currently used in Albania.

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Table 1.
Criteria for evaluating FinTech alternatives.

Id	Criteria	Description	References
C1	Security	Protects data and prevents its misuse	Awodele et al. [25]
C2	Privacy	Protects user data against misuse	Li et al. [26]
C3	Costs	All expenses associated with the service's pricing	Garad et al. [27]
C4	Technical support	Resolving problems quickly and efficiently	Li et al. [26]
C5	Ease of integration	Simple connectivity to various platforms	Awodele et al. [25]
C6	Usability	Ease of use	Sahar et al. [28]
C7	Legal applicability	Adhering to local and international standards.	Ren [29]
C8	Flexibility	Adjusting to changes in the application	Li et al. [26]
C9	Customization	Adjusting to the needs of users	Sahar et al. [28]
C10	Speed of transactions	Transaction processing speed	Senturk and Baghirov [30]
C11	Customer perceived value	Creating a sense that users are gaining more value	Sahar et al. [28]
C12	Expansion potential	The ability to evolve as users' needs grow	Garad et al. [27]

For this research, the following FinTech platforms were selected: EasyPay (FT 1), Paysera Albania (FT 2), POK (RPay) (FT 3), Vcoin (FT 4), T Blocks (FT 5), Ailend (FT 6), OpenPay (FT 7), Pago. al (FT 8), PayLink Albania (FT 9), and Patoko (FT 10).

After experts helped select the criteria and alternatives for this research, a survey questionnaire was developed based on them. This questionnaire was designed for experts first to evaluate the importance of the research criteria, then to assess how well the selected alternatives meet these criteria. The ratings were provided as linguistic values ranging from very bad to very good, with seven levels (Table 2). Once the questionnaires were prepared, they were sent to the experts for completion. After collecting the responses, the data were organized for use in the MCDM process. To apply linguistic values, a membership function was defined to convert these values into fuzzy numbers (Table 2). When defining the membership function, a triangular fuzzy number was used, and efforts were made to ensure the values aligned with the linguistic assessments.

Table 2.
Linguistic rate values and membership functions.

Linguistic value	Id	Fuzzy number
Very bad	V-B	1, 1, 2
Bad	B	1, 2, 3
Medium bad	M-B	1, 3, 5
Medium	M	3, 5, 7
Medium good	M-G	5, 7, 9
Good	G	7, 8, 9
Very Good	V-G	8, 9, 9

The final phase of this research involves implementing the MCDM method. In this study, the fuzzy LMAW and fuzzy CRADIS methods were used. These methods were selected because both have been applied over 200 times in practice, demonstrating their proven effectiveness. The following sections will outline the steps of these methods.

When assessing the importance of the criteria weights, the fuzzy LMAW method will be used. The LMAW method was first introduced by Pamučar et al. [31]. Unlike other MCDM methods that focus on calculating criteria weights, this method can also rank alternatives [32]. In this research, this method will be used solely to determine the criteria weights, so the steps for ranking will not be described.

Step 1. Prioritization of criteria. In this step, experts evaluate the criteria based on a defined scale for evaluating criteria and alternatives (Table 1), which includes a linguistic value scale.

Step 2. Conversion of linguistic values into fuzzy numbers. This step involves performing a transformation based on the membership function (Table 1).

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Step 3. Defining the absolute anti-ideal point ($\tilde{\gamma}_{AIP}$). To determine this value, the smallest value in the formed fuzzy decision matrix is first identified. Then, the absolute anti-ideal point is calculated by setting this value to 0.1 less than the smallest value.

Step 4. Defining the relationship vector. With this number, the decision matrix is divided by the absolute anti-ideal point.

$$\tilde{\mu}_{Cn}^{e} = \left(\frac{\tilde{\gamma}_{Cn}^{e}}{\tilde{\gamma}_{AIP}}\right) \quad (1)$$

Step 5. Determining the vector of weight coefficients. This step is performed for each expert separately.

$$\tilde{\omega}_{j}^{e} = \left(\frac{\ln(\tilde{\mu}_{Cn}^{e})}{\ln(\prod_{j=1}^{n}\tilde{\mu}_{Cn}^{e})}\right) \quad (2)$$

Step 5. Calculation of the final value of the criterion weights. This step is performed based on the calculation of the average vectors of the weighting coefficients.

In this research, the fuzzy CRADIS method will be used to rank FinTech alternatives. This method was first applied in practice by Puška et al. [33]. The uniqueness of this method is that it combines modified steps from other methods, namely ARAS (Additive Ratio Assessment), TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), and MARCOS (Measurement of Alternatives and Ranking according to Compromise Solution), while also having its own distinctive steps that set it apart from other similar MCDM methods. The steps of this method are as follows:

Step 1. Evaluation of alternatives and formation of a linguistic decision matrix. In this step, the expert evaluates how the alternatives satisfy the criteria using scores in the form of linguistic values.

Step 2. Transformation of the linguistic decision matrix into a fuzzy decision matrix. In this step, the membership function is used, and triangular fuzzy numbers ($x_{ij}^{l}, x_{ij}^{m}, x_{ij}^{u}$) are formed.

Step 3. Normalization of the decision matrix. In this step, the values of fuzzy numbers for individual criteria are divided by the largest value of the fuzzy number for that criterion.

$$\tilde{n} = \left(\frac{x_{ij}^{l}}{x_{id}^{u}}, \frac{x_{ij}^{m}}{x_{id}^{u}}, \frac{x_{ij}^{u}}{x_{id}^{u}}\right) \quad (3)$$

where x_{id}^{u} is the largest fuzzy value of alternatives for a particular criterion.

Step 4. Weighted decision matrices. In this step, the normalized values of fuzzy numbers are multiplied by the appropriate weights.

$$\tilde{v}_{ij} = \tilde{n}_{j} \times \tilde{w}_{j} \quad (4)$$

Step 5. Determination of the ideal and anti-ideal solutions. The ideal solution represents the highest value of the fuzzy number in the weighted decision-making matrix. In contrast, the anti-ideal solution represents the lowest value of the fuzzy number in the weighted decision-making matrix.

$$t_{i} = \max \tilde{v}_{ij}, \text{ gdje je } \tilde{v}_{ij} = \left(v_{ij}^{l}, v_{ij}^{m}, v_{ij}^{u}\right) \quad (5)$$

$$t_{ai} = \min \tilde{v}_{ij}, \text{ gdje je } \tilde{v}_{ij} = \left(v_{ij}^{l}, v_{ij}^{m}, v_{ij}^{u}\right) \quad (6)$$

Step 6. Calculation of deviations from the ideal and anti-ideal solutions. In this step, the ideal solution is subtracted from the weighted values, followed by subtracting the anti-ideal solution from the weighted values.

$$d^{+} = t_{i} - \tilde{v}_{ij} \quad (7)$$

$$d^{-} = \tilde{v}_{ij} - t_{ai} \quad (8)$$

Step 7. Determining optimal alternatives. These alternatives represent the minimum and maximum values for individual criteria when deviating from the ideal and anti-ideal solutions, respectively.

Step 8. Calculating the overall deviation score. In this step, the total value for alternatives is determined, including the optimal alternatives.

$$s_{i}^{+} = \sum_{j=1}^{n} d^{+} \quad (9)$$

$$s_{i}^{-} = \sum_{j=1}^{n} d^{-} \quad (10)$$

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Step 9. Defuzzification of aggregate deviation scores. In this step, fuzzy numbers are transformed into crisp values.

$$s_i^{\pm}{}_{def} = \frac{d_i^l + 4d_i^m + d_i^u}{6} \quad (11)$$

Step 10. Calculating the utility function. This step involves calculating the deviation of the alternatives from the optimal alternatives.

$$K_i^+ = \frac{s_0^+}{s_i^+} \quad (12)$$

$$K_i^- = \frac{s_i^-}{s_0^-} \quad (13)$$

where s_0^+ and s_0^- are optimal alternatives.

Step 11. Ranking the alternatives. The final value is obtained by calculating the average value of the utility functions.

$$Q_i = \frac{K_i^+ + K_i^+}{2} \quad (14)$$

The best alternative is the one that has the highest value in the fuzzy CRADIS method and vice versa.

4. Results

The first step in applying the MCDM method to evaluate which FinTech alternative has the best indicators is to determine the importance of the criteria. When assessing the importance of the criteria, the ratings provided by experts in the form of linguistic values (Table 3) are used. These ratings form the basis for assigning weights to the criteria using the fuzzy LMAW method. Since this method has been widely used in practice, its detailed steps will not be explained. After collecting the expert ratings, the ratings are prepared for analysis by converting them into appropriate fuzzy numbers. For example, the linguistic value 'very good' is transformed into the fuzzy number 8, 9, 9. This conversion is carried out using the defined membership function (Table 2).

Table 3.
Criteria values using linguistic terms.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Expert 1	V-G	G	M-B	B	ME	M-G	G	B	B	M-B	M-G	V-B
Expert 2	V-G	V-G	M-B	ME	M-G	ME	B	V-B	B	M-B	M-G	B
Expert 3	G	V-G	M-B	ME	M-G	ME	M-G	M-B	B	M-B	ME	B
Expert 4	V-G	G	ME	M-G	M-G	ME	M-G	M-B	B	M-B	ME	M-B
Expert 5	V-G	V-G	M-G	ME	M-B	B	G	M-B	ME	M-B	M-G	B
Expert 6	V-G	V-G	B	M-B	ME	ME	G	M-B	B	M-B	M-G	V-B
Expert 7	V-G	G	ME	M-B	ME	B	G	M-B	ME	B	M-G	M-B
Expert 8	V-G	G	M-G	ME	M-B	ME	G	M-B	ME	M-G	M-G	M-B

Since the lowest rating was “very bad,” the corresponding fuzzy number is 1. Therefore, the absolute anti-ideal point must be less than this; in this study, it was set to 0.9. All fuzzy values in this membership function are then divided by this value to form a vector relationship (Expression 1). Next, the natural logarithm (*ln*) of the relationship vector values is calculated. After computing all the natural logarithm (*ln*) values, the product of each expert's values across all criteria is also determined, and individual values are divided by this product (Expression 2). This process results in the criterion weight vector. The final step is to calculate the average of the weight vector, which represents the final weights for the criteria. Using the fuzzy LMAW method and based on expert ratings, results indicate that C1 - Security and C2 - Privacy are the most important criteria for selecting a FinTech alternative. The results clearly show that security and privacy are the foundational criteria for these alternatives.

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Table 4.
Values of criterion weights.

C1	C2	C3	C4
0.095, 0.121, 0.187	0.093, 0.119, 0.187	0.017, 0.076, 0.150	0.022, 0.077, 0.151
C5	C6	C7	C8
0.033, 0.089, 0.166	0.030, 0.077, 0.148	0.059, 0.101, 0.172	0.005, 0.045, 0.121
C9	C10	C11	C12
0.012, 0.056, 0.119	0.007, 0.065, 0.138	0.069, 0.104, 0.182	0.005, 0.030, 0.101

After the weights of the criteria are determined, a ranking order is established. The basis for this ranking is the expert ratings (Table 5). First, the experts evaluate how well each FinTech alternative meets these criteria and then provide ratings using linguistic terms. Next, these ratings are converted into fuzzy numbers, and a summary fuzzy decision matrix is created. This matrix is formed by calculating the mean value of the fuzzy numbers from all experts. This way, all experts have an equal influence on the ranking of the alternatives.

Table 5.
FinTech alternatives rating

Expert 1	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
FT 1	V-G	V-G	G	V-G	G	V-G	G	V-G	G	V-G	G	V-G
FT 2	G	G	V-G	G	V-G	G	G	V-G	G	G	V-G	G
FT 3	G	M-G	G	V-G	G	M-G	G	V-G	G	V-G	M-G	G
FT 4	ME	M-G	M-B	M-G	ME	M-G	M-B	ME	M-B	M-G	ME	M-B
FT 5	M-G	M-G	ME	M-B	ME	M-B	M-G	M-B	ME	M-B	ME	ME
FT 6	M-G	M-B	ME	M-B	M-B	M-G	M-G	M-B	ME	ME	ME	M-B
FT 7	M-G	ME	M-G	ME	M-G	ME	M-G	ME	M-G	M-G	ME	M-G
FT 8	M-G	G	M-G	G	M-G	ME	G	M-G	G	M-G	G	M-G
FT 9	ME	M-B	ME	ME	ME	M-B	M-G	M-G	M-G	ME	M-G	ME
FT 10	ME	G	M-G	ME	M-B	M-B	M-G	ME	M-G	M-B	M-G	ME
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Expert 8	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
FT 1	V-G	V-G	V-G	G	V-G	G	V-G	G	V-G	G	V-G	G
FT 2	G	G	G	G	G	G	G	G	M-G	G	V-G	G
FT 3	M-G	G	M-G	G	M-G	G	M-G	G	M-G	G	M-G	G
FT 4	ME	M-G	G	M-G	G	M-G	ME	G	M-G	ME	G	M-G
FT 5	ME	M-B	ME	M-G	M-B	M-G	ME	ME	M-B	M-G	ME	M-G
FT 6	M-G	M-G	ME	M-G	ME	M-B	M-G	ME	ME	ME	M-B	ME
FT 7	ME	M-G	ME	M-G	ME	M-G	ME	M-G	ME	ME	M-G	ME
FT 8	ME	ME	M-B	ME	M-B	M-G	ME	M-B	M-G	ME	M-B	M-G
FT 9	M-G	M-B	ME	M-G	M-B	M-B	ME	M-G	M-B	ME	M-G	M-B
FT 10	ME	M-G	ME	ME	M-B	ME	M-B	ME	M-B	ME	M-B	ME

When this decision matrix is created, the normalization of these fuzzy numbers is then performed. Because of the specific nature of the defined ratings in the form of linguistic values, all FinTech platforms are rated uniformly. This is because the defined ratings treat each criterion as a benefit criterion, and the value should be higher for the FinTech alternative to be considered better. For this reason, the same normalization is applied to all criteria (Expression 3). Following this, the normalized values are weighted. This step is a standard part of MCDM methods, where the normalized data values are multiplied by the appropriate criteria weights (Expression 4). After these two steps that are common for MCDM methods, specific steps for the fuzzy CRADIS method follow. First, the ideal and anti-ideal solutions for this weighted decision matrix are determined. The ideal solution is the largest value of the fuzzy number in the weighted decision matrix, which is 0.187, while the anti-ideal solution is the smallest value in this matrix, which is 0.001. Then, the weighted values are subtracted from the ideal solution (Expression 7), and the anti-ideal solution is subtracted from the weighted values (Expression

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8), creating deviations from these values. After calculating the deviations from both the ideal and anti-ideal solutions, two matrices are formed that represent these deviations. Then, ideal alternatives are identified as those that have the smallest distance to all alternatives in relation to the ideal solution, or the largest distance from all alternatives in relation to the anti-ideal solution for individual matrices. The next step is to calculate the aggregate deviation score, which is obtained by summing all values for each alternative (Expressions 9 and 10). After that, defuzzification is performed (Expression 11), and utility functions are calculated (Expressions 12 and 13). Based on the average of these functions (Expression 14), a ranking of FinTech alternatives is formed (Table 6).

The results, based on expert ratings and the implementation of the fuzzy CRADIS method's steps, show that FT 1 - EasyPay has the best indicators and received nearly all top ratings from experts. This is followed by the FinTech alternatives FT 2 - Paysera Albania and FT 3 - POK (RPay), which also performed very well. These three FinTech alternatives stand out significantly compared to the others and should be the top choices for implementing FinTech in Albania. Given the substantial differences among these three options, conducting a sensitivity analysis would result in the same order, making it not applicable in this research. The ranking might change for alternatives ranked 5 and 6, as well as for alternatives ranked 7 and 8, because of the slight differences between them. Reducing the criteria weights could alter the ranking of these alternatives.

Table 6.
Ranking of FinTech alternatives using the fuzzy CRADIS method.

	s^+	s^-	$Def s^+$	$Def s^-$	K_i^+	K_i^-	Q_i	RANK
FT 1	0.42, 1.32, 1.86	0.37, 0.75, 0.95	1.260	0.718	1.000	0.999	1.000	1
FT 2	0.42, 1.36, 1.88	0.35, 0.71, 0.95	1.289	0.688	0.977	0.959	0.968	2
FT 3	0.42, 1.42, 1.93	0.30, 0.65, 0.95	1.336	0.641	0.942	0.892	0.917	3
FT 4	0.59, 1.56, 2.01	0.22, 0.50, 0.78	1.474	0.503	0.854	0.701	0.778	4
FT 5	0.68, 1.62, 2.05	0.18, 0.44, 0.69	1.537	0.441	0.819	0.614	0.716	7
FT 6	0.78, 1.68, 2.07	0.16, 0.38, 0.59	1.597	0.380	0.788	0.529	0.659	9
FT 7	0.61, 1.59, 2.04	0.19, 0.47, 0.76	1.505	0.472	0.837	0.658	0.747	5
FT 8	0.63, 1.59, 2.03	0.20, 0.47, 0.74	1.507	0.470	0.835	0.655	0.745	6
FT 9	0.68, 1.63, 2.06	0.17, 0.44, 0.69	1.543	0.435	0.816	0.605	0.711	8
FT 10	0.97, 1.79, 2.13	0.10, 0.28, 0.40	1.709	0.269	0.737	0.374	0.555	10
S_o	0.42, 1.32, 1.86	0.37, 0.75, 0.95	1.259	0.718				

5. Discussion

The development of digitalization has influenced the creation of new financial instruments. Based on this, FinTech platforms have been developed. These serve as key elements in the digital transformation of the financial sector. The impact of these instruments is not just about applying digital technologies but also about changing how individuals and companies access finance. Traditional financial systems are slow, costly, and complex. In contrast, FinTech applications offer faster, more affordable, and easier services, allowing transactions to be completed in real time [34]. Additionally, users now have access to new financial products resulting from the digitalization of the financial sector. Given its great potential, FinTech is particularly promising for developing countries like Albania, where it can improve the financial sector and support economic growth.

FinTech is evolving through new technologies such as blockchain, artificial intelligence, cryptocurrencies, and other innovations that influence financial operations [35]. These technologies are transforming how funds are managed and transacted, enabling the use of diverse data. In developed countries, FinTech represents an upgrade to the banking system, while in developing countries, its goal is to transform the existing financial system, where users could be offered various services that reduce the need to visit banks. This is especially important for businesses that do not have to spend time on daily transactions [36]. In this way, the population can also benefit from these services, making business easier [37]. Therefore, it was important to research FinTech in Albania to provide guidelines for practical choices that can promote growth, particularly in the business sector.

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Besides boosting a country's growth, FinTech has a broader social impact that is reflected in the development of financial literacy and expanding access to global markets, which provide the population with access to more favorable financial resources. Thanks to the advanced analytical tools that FinTech offers, it is easier to meet users' needs, simplifying everyday financial tasks. However, alongside its benefits, FinTech also presents risks, such as the potential for cyber-attacks and attempts to steal user data. Therefore, it is crucial to protect these services further and enhance their safety for users. Additionally, protecting user privacy is essential.

The research involved examining which FinTech platform has the best characteristics in Albania. This research aimed to investigate the transformation of the financial sector in Albania due to digitalization. Eight experts in the field evaluated 12 criteria and 10 FinTech alternatives. By applying the fuzzy LMAW method and expert ratings, the results indicated that user security and privacy should be prioritized in these services. This is because users are vulnerable to cyber-attacks, and the security of transactions could be at risk. Therefore, these FinTech platforms need to examine these aspects more carefully to boost acceptance and practical use, as enhancing these features is crucial.

To select the best FinTech platform based on indicators, the fuzzy CRADIS method was used. This method, which relies on expert ratings, revealed that the EasyPay platform has the most desirable characteristics. It stands out for excelling in all categories, especially security, ease of use, and transaction speed. The results also highlight Paysera Albania and POK (RPay) as strong performers, alongside EasyPay, dominating the competition. These two platforms have significant potential that needs further development to boost security and protect user privacy. Next steps involve improving the user experience and providing better technical support. Other platforms, like Patoko, struggle with flexibility and functionality, so developers should focus on making them more competitive.

6. Conclusions

The conducted research has shown that FinTech alternatives have strong potential for developing the financial sector. The results indicate that further work is needed to improve security and user privacy protection to encourage more practical use of these alternatives. Additionally, the research demonstrated that the EasyPay platform is rated higher by experts compared to other platforms. Expert assessment in this study was conducted using a fuzzy approach, which is important because decision-making in this area often involves uncertainty. This is due to experts sometimes lacking complete information and making decisions with incomplete data using linguistic values. Therefore, this research has shown that MCDM methods can be applied in the Albanian financial sector, which is one of the key contributions of this research.

This research shows that there are certain obstacles to the use of FinTech by users in Albania. Clearly, the biggest problem is the low level of financial literacy among users, which slows down the further spread of FinTech in the country. Efforts are needed to build trust in FinTech, such as organizing educational programs on digital literacy for the general population and for interest groups that influence the development of the financial sector in Albania. Additionally, it is important to influence policymakers so that innovations in the financial sector can be implemented as quickly as possible.

The research provided guidelines for future studies, indicating that exploring the use of mobile payment systems, digital wallets, P2P, and blockchain technology in the financial sector could be valuable. These additional tools would speed up transactions, lower costs, and enhance inclusiveness in the financial system. Developing these innovations would support the growth of this sector, which plays a crucial role in Albania's development. Moreover, these services offer access to various financial options that are not available through traditional banking. The goal of FinTech is to reduce bank visits and digitize financial transactions, which also positively impacts sustainability and environmental protection. Therefore, future research should also consider these factors.

This research has demonstrated that FinTech drives the development of Albania's financial sector, leading to further modernization and digitalization efforts. The methodology applied proved highly

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flexible and should be adopted in future studies when choosing between multiple options. Additionally, the results suggest that more research is needed to integrate security and regulatory aspects to support the growth of the financial sector and increase user trust in FinTech.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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