Navigating Indonesia's Digital Marketplace: An ARAS Approach for MSME Growth

I'tishom Al Khoiry [1], Ika Menarianti[2], Nadiati[3], Pradifaliani Nurhidayati[4], Gatut Zakka Habibi Wigdagdo[5]
Universitas PGRI Semarang, Indonesia
itishom@upgris.ac.id

Abstract
Micro, Small, and Medium Enterprises (MSMEs) are crucial to Indonesia's economy, driving growth and job creation. However, they face challenges like limited market access and inadequate digital skills, which hinder their competitiveness. Selecting the right marketplace is essential for MSMEs to enhance their presence and optimize operations. The Additive Ratio Assessment (ARAS) method provides a structured approach for evaluating marketplace options based on criteria such as operational costs, user-friendliness, features, customer support, and transaction security. By applying the ARAS method, MSMEs can identify platforms that best meet their needs while maximizing overall value. This evaluation offers clear guidance for MSMEs in choosing marketplaces that foster growth and sustainability in the digital economy. Ultimately, ARAS enhances decision-making for Indonesian MSMEs, enabling them to succeed in an increasingly competitive digital landscape.

Keywords: ARAS; Digital Economy; Indonesia; Marketplace Selection; MSMEs

INTRODUCTION

Micro, Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the national economy, playing a crucial role in driving economic growth and creating job opportunities. According to Law No. 20 of 2008 concerning MSMEs, this sector encompasses various types of businesses managed by individuals or small groups with specific asset and revenue thresholds. MSMEs significantly contribute to economic development, community empowerment, and the improvement of societal welfare [1]. However, MSMEs in Indonesia still face several challenges that hinder their growth potential. One of the main obstacles is limited access to broader markets and a lack of skills in leveraging digital technology to enhance their reach and revenue [2]. Many MSMEs have yet to effectively optimize the use of digital technology, resulting in missed opportunities to compete and grow in an increasingly competitive marketplace[3].

In this context, selecting the appropriate marketplace becomes crucial for MSMEs to expand their market presence and improve their competitiveness. Marketplaces can assist MSMEs in reaching a larger customer base, optimizing operations, and increasing sales [4]. With the increasing number of available platform options, MSMEs require clear guidance in choosing the platform that best suits their business needs. To address these challenges, various methodologies and approaches have been developed by researchers to aid decision-making, commonly referred to as Multi-Criteria Decision Making (MCDM) [5]. Popular MCDM methods that have been widely implemented in research include AHP, TOPSIS, SAW, ELECTRE, WP, and ARAS [6]. Among these methods, ARAS is one of the newest MCM techniques introduced in 2010 [7]. The ARAS method is an effective tool for multi-criteria decision-making due to its ability to evaluate various alternatives based on established criteria [8]. Using this method, each marketplace can be assessed based on the added value it provides against key criteria such as operational costs, user-friendliness, features, customer support, and transaction security. By applying the ARAS method, MSMEs can identify marketplaces that not only meet their business needs but also offer the best overall added value. The results of this evaluation process are expected to provide clear and objective guidance for MSMEs in selecting marketplaces that will support the sustainability and growth of their businesses in the digital market. The ARAS method offers a systematic and structured approach, facilitating better and more advantageous decision-making for MSMEs in the digital era.

METHOD

This research begins with a literature review related to the understanding of the application of the ARAS method in decision support systems. The literature review is conducted by studying various sources, including international journals, national journals, books, scholarly works, and internet resources, to support the research process.The next step is to formulate the problem by determining the variables needed for the decision support system. The variables used in this study consist of criteria and alternatives. Criteria are the parameters employed in evaluating the alternatives. This research utilizes relevant criteria obtained through the literature review, which includes five criteria outlined in Table 1. The alternatives in this study are the marketplaces used by MSMEs (Micro, Small, and Medium Enterprises) for selling, as shown in Table 2. operational costs, user-friendliness, features, customer support, and transaction security

Table 1. Criteria

Code	Criteria	Type	Weight
FT	*Feature*	Benefit	0.30
OC	*Operational Cost*	*Cost*	0.25
UF	*User-friendliness*	Benefit	0.20
CS	*Customer Support*	Benefit	0.15
TS	*Transaction Security*	Benefit	0.10

Table 2. Alternative

Code	Alternative
TP	Tokopedia
BL	Bukalapak
SP	Shopee
LZ	Lazada
BL	Blibli

Data Collection Stage

This research utilizes a questionnaire as the primary method for data collection. The questionnaire is designed to gather information regarding the experiences and evaluations of sellers actively engaged in various marketplaces in Indonesia. The data collection stage consists of one main step: Questionnaire Distribution. The questionnaire is distributed to sellers randomly selected from marketplaces such as Tokopedia, Shopee, Bukalapak, Lazada, and Blibli, ensuring a diverse range of experiences among participants. Participants will evaluate various alternatives using a Likert scale, allowing them to provide ratings from 1 to 5 for each alternative based on their experiences. The questionnaire was distributed to 10 respondents for each alternative using the Google Forms platform for convenience.

ARAS Method

This study employs the Additive Ratio Assessment (ARAS) method to evaluate and select the most suitable marketplace for Micro, Small, and Medium Enterprises (MSMEs) in Indonesia. The ARAS method performs ranking by comparing the values of each criterion for each alternative, considering the weights assigned to obtain the ideal alternative [9]. In the ARAS method, the utility function values that determine the relative efficiency of viable alternatives are directly proportional to the relative effects of the values and weights of the key criteria considered in determining the best alternative [10]. ARAS is based on the argument that complex problems can be understood simply through relative comparisons. In ARAS, the ratio of the sum of normalized and weighted criterion values, which represent the alternatives being considered, is compared to the total of normalized and weighted criterion values that represent the optimal alternative [11]. In the classical approach, multi-criteria decision-making methods focus on ranking. MCDM methods compare the utility function values of existing solutions with the values of positive ideal alternative solutions or consider the distance to the positive and negative ideal solutions. In contrast, the ARAS method compares the utility functions of alternatives with the values of the optimal utility function [12]. The ARAS method involves several steps in the ranking process [13]–[17].

1. **Formation of the Decision Making Matrix (X)**

   In the decision-making matrix (X), the rows represent alternatives and the columns represent criteria. The decision matrix shows the performance of each alternative against various criteria

$$\boldsymbol{x_{ij}} = \begin{bmatrix} \boldsymbol{x_{11}} & \boldsymbol{x_{12}} & \cdots & \boldsymbol{x_{1n}} \\ \boldsymbol{x_{21}} & \boldsymbol{x_{22}} & \cdots & \boldsymbol{x_{2n}} \\ \vdots & \vdots & \vdots & \vdots \\ \boldsymbol{x_{m1}} & \boldsymbol{x_{m2}} & \cdots & \boldsymbol{x_{mn}} \end{bmatrix} \tag{1}$$

   Where:
   $\boldsymbol{x_{ij}}$ = performance value of the i i-th alternative with respect to the j j-th criterion,
   $\boldsymbol{m}$ = number of alternatives,
   $\boldsymbol{n}$ = number of criteria.

2. **Formation of the Normalized Matrix (R)**

   Benefit-type criteria are normalized using the following linear normalization procedure:

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}}} \text{ ; j = 1, 2, ..., n} \tag{2}$$

   Where R_{ij} is the normalized value

   Cost-type criteria are normalized using two procedures. In the first stage, the inverse of each criterion relative to all alternatives is taken as follows:

$$x_{ij}^{*} = \frac{1}{x_{ij}} \text{ ; i = 1, 2,......, m; j = 1, 2, ..., n} \tag{3}$$

   In the second stage, normalized values are calculated as follows:

$$R_{ij} = \frac{x_{ij}^{*}}{\sum_{i=1}^{m} x_{ij}^{*}} \text{ ; j = 1, 2, ..., n} \tag{4}$$

3. **Formation of the Weighted Normalized Matrix (D)**

The weighted normalized matrix is formed by multiplying the normalized values by their corresponding criterion weights, reflecting the relative importance of each criterion for each alternative.

$$D = [d_{ij}]_{mxn} = r_{ij} \cdot w_j \text{ ; i = 1, 2,......, m; j = 1, 2, ..., n} \tag{5}$$

Where:
D = weighted decision matrix,
d_{ij} = the element of the weighted decision matrix for alternative i under criterion j,
r_{ij} = normalized value for alternative i and criterion j,
w_j = weight assigned to criterion j.

4. **Determining the Value of the Optimum Function (S)**

$$S_i = \sum_{j=1}^{n} d_{ij} \text{ ; i = 1, 2,......, m; j = 1, 2, ..., n} \tag{6}$$

Where S_i is the optimum function value of the i-th alternative. The largest value is the best, and the smallest value is the worst. Considering the process, the proportional relationship with the value and weight of the criteria studied affects the final result.

5. **Determining the Utility Ranking (K)**

$$K_i = \frac{S_i}{S_0}; i = 0, 1, 2, \ldots\ldots, m; \tag{7}$$

Where S_i and S_0 are the optimization criteria values. The utility value K_i is in the interval [0,1], and the highest K value represents the priority value. The formula for S_0 is given by:

$$S_0 = \sum_{j=1}^{n} D_{0j}' \tag{8}$$

Where D_{0j} is the highest value for each criterion corresponding to the best alternative, and n n is the number of criteria

RESULTS AND DISCUSSION

1. **Formation of the Decision Making Matrix (X)**

The first step is to construct the decision matrix, which contains the performance values of different alternatives with respect to various criteria. This matrix was developed using Eq. (1), and the results are shown in Table 3. The data obtained represents the average values from 10 respondents for each alternative.

Table 3. Alternative

Code	**FT**	**OC**	**UF**	**CS**	**TS**
TP	4.6	4.5	4.6	4.6	4.7
BL	4.3	4.3	4.1	4.2	4.2
SP	4.7	4.6	4.8	4.7	4.6
LZ	4.4	4.4	4.3	4.5	4.4
BB	4.3	4.3	4.3	4.3	4.4

2. Formation of the Normalized Matrix (R)

Normalization is performed for the benefit-type criteria (FT, UF, CS, TS) using Eq. (3), shown in Table 4. While normalization for the cost-type criteria (OC) is performed using the Eq. (3-4). The normalized values are presented in Table 5.

Table 4. Normalized Benefit Criteria

Code	**FT**	**UF**	**CS**	**TS**
TP	0.2064	0.2086	0.2064	0.2103
BL	0.1923	0.1856	0.1887	0.1870
SP	0.2103	0.2175	0.2103	0.2064
LZ	0.1973	0.1957	0.2013	0.1973
BB	0.1923	0.1957	0.1933	0.1973

Table 5. Normalized Cost Criteria

Code	**OC**
TP	0.1963
BL	0.2053
SP	0.1929
LZ	0.2000
BB	0.2053

3. Formation of the Weighted Normalized Matrix (D)

The normalized values were then multiplied by the corresponding criterion weights to form the weighted normalized matrix, as outlined in Eq. (5). The results of this step can be seen in Table 6.

Table 6. Weighted Normalized Matrix (D)

Code	**FT**	**OC**	**UF**	**CS**	**TS**
TP	0.0619	0.0491	0.0417	0.0310	0.0210
BL	0.0577	0.0513	0.0371	0.0281	0.0204
SP	0.0631	0.0482	0.0435	0.0350	0.0206
LZ	0.0592	0.0500	0.0433	0.0295	0.0197
BB	0.0577	0.0513	0.0426	0.0286	0.0204

4. Determining the Value of the Optimum Function (S)

Using Eq. (6), the optimum function values were calculated by summing the weighted values for each alternative. The results, which represent the overall performance of each alternative, are shown in Table 7.

Table 7. Optimum Function Value (S)

Code	**S**
TP	0.2047
BL	0.1946
SP	0.2104
LZ	0.2017
BB	0.2006

5. **Determining the Utility Ranking (K)**

   Finally, the utility ranking was determined using Eq. (7-8). The alternatives were ranked based on their utility values, with the results summarized in Table 8.

Table 8. Utility Ranking (K)

Code	**S**	**K**	**Rank**
TP	0.2047	0.9579	2
BL	0.1946	0.9107	5
SP	0.2104	0.9823	1
LZ	0.2017	0.9426	3
BB	0.2006	0.9368	4

CONCLUSION

The selection of an appropriate marketplace is a critical factor for the success of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia's digital economy. Through the application of the Additive Ratio Assessment (ARAS) method, this study has demonstrated a structured approach to evaluating multiple marketplace options based on key criteria such as operational costs, user-friendliness, features, customer support, and transaction security. The results of the analysis indicated that Shopee emerged as the most optimal marketplace for Indonesian MSMEs, with the highest utility ranking, followed by Tokopedia and Lazada. These platforms were found to provide the greatest overall value based on the criteria considered. The ARAS method's systematic evaluation offers clear and objective guidance to MSMEs, enabling them to make informed decisions that can significantly enhance their competitiveness and sustainability in the digital marketplace. In conclusion, this research underscores the importance of a methodical approach to marketplace selection and highlights the potential of ARAS in facilitating decision-making for MSMEs aiming to thrive in an increasingly competitive digital landscape.

ACKNOWLEDGEMENTS

We would like to thank everyone who participated in this study by completing the questionnaire. Your input and experiences were essential to the evaluation of the different marketplaces. We are especially grateful to the marketplace sellers for sharing their insights, which helped us better understand the challenges faced by MSMEs in Indonesia's digital economy. Your contributions made this research possible.

REFERENCES

[1] E. Mufidah, A. R. Pudyaningsih, S. Hastari, and M. T. Ghifary, “Pelatihan Kegiatan E-Commerce Sebagai Media Pemasaran Online Bagi Pelaku UMKM di Kelurahan Kandangsapi Kecamatan Panggungrejo Kota Pasuruan,” *JMM-Jurnal Masy. Merdeka*, vol. 3, no. 2, 2021.

[2] I. Kamil, A. A. Bakri, S. Salingkat, A. Ardenny, J. P. Tahirs, and A. Alfiana, “Pendampingan UMKM melalui Pemanfaatan Digital Marketing pada Platform E-Commerce,” *Amalee Indones. J. Community Res. Engagem.*, vol. 3, no. 2, pp. 517–526, 2022.

[3] E. S. Soegoto, U. Narimawati, H. Soegoto, M. Iffan, W. Novianti, and D. Nurdiansyah, “Penguatan Daya Saing UMKM Pengepul Buah Mangga di Kabupaten Majalengka

dengan Memanfaatkan Pemasaran Digital," *BERNAS J. Pengabdi. Kpd. Masy.*, vol. 4, no. 3, pp. 2371–2377, 2023.
[4] S. A. SAPUTRI, I. BERLIANA, and M. F. NASRIDA, "Peran marketplace dalam meningkatkan daya saing UMKM di Indonesia," *Knowl. J. Inov. Has. Penelit. dan Pengemb.*, vol. 3, no. 1, pp. 69–75, 2023.
[5] I. Menarianti, I. Al Khoiry, and C. Fathurachman, "A TOPSIS Framework for Supplier Selection Problem," *J. Inovtek Polbeng Seri Inform.*, vol. 9, no. 1, 2024.
[6] I. Al Khoiry, R. Gernowo, and B. Surarso, "Fuzzy-AHP MOORA approach for vendor selection applications," *Regist. J. Ilm. Teknol. Sist. Inf.*, vol. 8, no. 1, pp. 24–37, 2022.
[7] M. Saidi-Mehrabad, F. Saeedi, D. Rezaei, and R. Ghousi, "Developing an Organizational Performance Evaluation Model Using Grounded Theory Methodology and ARAS Method," *Sci. Iran.*, 2023.
[8] A. Iskandar, "Penyeleksian Penerimaan Teleservice Representative dengan Penerapan Metode ARAS dan Pembobotan ROC," *JURIKOM (Jurnal Ris. Komputer)*, vol. 10, no. 2, pp. 548–557, 2023.
[9] M. I. Syahputra and L. Yulianti, "Implementation Of Additive Ratio Assessment (Aras) Method For Online Reward Driver Provision," *J. Media Comput. Sci.*, vol. 1, no. 2, pp. 233–244, 2022.
[10] E. K. Zavadskas and Z. Turskis, "A new additive ratio assessment (ARAS) method in multicriteria decision-making," *Technol. Econ. Dev. Econ.*, vol. 16, no. 2, pp. 159–172, 2010.
[11] Z. Turskis and E. K. Zavadskas, "A novel method for multiple criteria analysis: grey additive ratio assessment (ARAS-G) method," *Informatica*, vol. 21, no. 4, pp. 597–610, 2010.
[12] S. Koçak, A. Kazaz, and S. Ulubeyli, "Subcontractor selection with additive ratio assessment method," *J. Constr. Eng. Manag. Innov.*, vol. 1, no. 1, pp. 18–32, 2018.
[13] V. M. M. Siregar, E. Sirait, L. L. Sihombing, and I. M. Siregar, "Best Employee Selection Using The Additive Ratio Assesment Method," *Internet Things Artif. Intell. J.*, vol. 3, no. 1, pp. 76–85, 2023.
[14] E. Soltani and M. M. Aliabadi, "Risk assessment of firefighting job using hybrid SWARA-ARAS methods in fuzzy environment," *Heliyon*, vol. 9, no. 11, 2023.
[15] N. Putra, K. Imtihan, P. Simanjuntak, M. Mesran, and H. Rohayani, "Decision Support System for Choosing the Best General Practitioner with Additive Ratio Assessment (ARAS) Method," *IJICS (International J. Informatics Comput. Sci.*, vol. 7, no. 1, pp. 11–17, 2023.
[16] V. Saravanan, M. Ramachandran, and K. Ramu, "Analysis of Material Selection using the ARAS Method," *J. Appl. Chem. Phys.*, vol. 2, p. 1, 2023.
[17] T. Barik, S. Parida, and K. Pal, "Application of ARAS Method for Finding Out the Best Possible Combination of Input Parameters for Least Hole Defects While Drilling CFRP Laminates," *NanoWorld J*, vol. 9, no. S1, pp. S192–S197, 2023.