Credit Loan Selection During the Pandemic Recommendation MCDM-Promethee Method

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Abstract: In the current state of COVID-19, many middle and lower-income businesses such as Micro, Small and Medium Enterprises (UMKM) have experienced a decrease in their income turnover, so that they require additional capital costs to carry on their business life. To provide additional capital loans, there are several requirements that must be met by every UMKM. Like an independent business that is carried out, whether it is permanent or only limited to domicile, then how long have they started the business they have built up to now, do they have collateral as loan guarantee, do they have a good level of business productivity during the running, seen from the report made, do you already have a lot of customers from the business you run. This is a benchmark for providing loans to UMKM. The method that can be recommended is Promethee, which is part of the Multi-Criteria Decision Making (MCDM) concept as a rating method in determining loan issues recommended by the Promethee method. The results obtained from the ranking with the Promethee method, namely that of the six selected and evaluated UMKM, the first rank was from the UMKM-3 with the highest weight value of 0.208, followed by UMKM-1 with a weight of 0.042 and followed by UMKM-5 which were still considered feasible even though they were not valuable. negative, while the other two UMKMs cannot be said to be eligible for a loan, namely UMKM-2 and UMKM-4 because they are negative.

Keywords: MCDM, Business Capital, Credit Loans, Promethee method, UMKM

INTRODUCTION

In the midst of the Covid-19 pandemic, especially middle and lower class entrepreneurs such as Micro, Small and Medium Enterprises (UMKM), many have experienced a decline in income (devisit income). This incident is not only felt by some of the small and medium-sized people, it turns out that the whole community feels that the situation is all that difficult. Thus, how to revive the economy of productive small entrepreneurs can maintain their survival (Nugroho, 2018), because middle and lower middle entrepreneurs must be saved. However, the lower-tier economy must be helped by loan assistance to those who feel the bitterness of life during the Covid-19 pandemic. These, especially UMKM who have a strong enthusiasm to face and revive their economy (Nasution, 2020) by providing assistance in the form of soft credit loans (Wahyudi, 2010),(Maryati, 2014). It is of great concern in terms of providing credit loans to UMKM with low purchasing power conditions (Susanto, 2017) there are several requirements that are used as a reference in evaluating credit lending, namely the first is that they live permanently or are only limited to domicile, the second is the period of business implementation. what has been done, third is whether it has collateral as loan collateral, the fourth is the level of business productivity that has been running well, the fifth is about the reporting that has been done whether it is always done or not and sixth, how many loyal customers have become their customers. This has become a barometer in providing credit loans to UMKM, it is fitting that in the conditions of the Covid-19 pandemic, the function of banks is to help them to be able to carry on their lives in maintaining the economic system, especially among the middle and lower class (four), which is a benchmark for the revival of the nation's economy (Muzdalifa et al., 2018).

The virtue of providing this credit loan is through a method that can be used in measuring credit loans, this is so that the selected recipient does not have bad credit in fulfilling their obligations (Akhmad, 2015). In fact, many of a number of MSMEs are engaged in online media in the form of e-commerce such as digital catalogs and digital stalls (Febriantoro, 2018),(Hakim et al., 2015),(Purnomo, 2019) and the like. So that in order to be able to select UMKM in obtaining credit loans for additional capital for their continuity, an appropriate method of selection

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must be carried out, namely by using the Promethee method which is part of the Multi-criteria Decision Making. the selection process and the ranking system with a linear upward pattern (Valasquez & Hester, 2016).

LITERATURE REVIEW

UMKM

From some literature that can be used as a reference to find out more things related to the selection process for providing loans to UMKM which are considered productive and reliable in reviving the nation's economy, especially to be able to provide additional finance to them in carrying out their lives (Alimudin et al., 2019) and UMKM. The business carried out is usually in the form of daily necessities that are sought after by the community (Anggraini & Nasution, 2013).

Multi-criteria Decision Making (MCDM).

Multi-criteria Decision Making (MCDM) is a multi-criteria selection technique. The methods that are widely used by researchers for problems related to the ranking system are one-way, meaning that there is no inversely proportional assessment, so this MCDM needs a comparison process (Chupiphon & Janjira, 2016),(Mazumdar, 2009) with other methods. For cases to be raised at this time, the Promethee method is not carried out comparisons with other methods, because the data to be processed is data that is linear in nature, so that the data processed is data that is directly proportional to determining the highest value. The highest value of the results of the process is the result that can be taken as a decision. Promethee is a part of the multi-criteria method so that it is still included in the MCDM.

Promethee Method

The method is widely used, especially in terms of ranking, which has reliability in terms of processing data that is directly proportional to data processing and also processing inversely. Promethee is widely known by researchers whose nature is able to reduce or the term to be precise eliminates data by comparing data with one another (Brans JP and Vincke Ph, 1985). This is one of the advantages of the Promethee method (Deshmukh, 2013). For problems related to the selection of credit loans from a number of UMKM, it is indeed a superior method of using the selection process and giving very optimal ratings for decision making (Chybowski et al., 2016),(Mazumdar, 2009).

Some of the steps carried out by the Promethee method are 1) Determining the magnitude of the preference index, 2) Calculating the multi-criteria preference, 3) Looking for Leaving flow, 4) Looking for Entering Flow, 5) Finding Net flow, and 6) Determine ranking as a support material for decision making (Deshmukh, 2013).

The advantage of this promethee is that it is able to process data with various conditions, such as an understanding that assumes that the largest value is the best, or vice versa, the smallest value is assumed to be the best value, but in this case it does not consider things as said above. Thus the use of the type of the criterion function is in the form of the usual criterian, which means that the data is considered to have a perception that the greatest value has the best meaning, meaning that the data is considered consistent, so the calculation is an ordinary preference (Brans JP and Vincke Ph, 1985). The formulation used is the meaning in line with the following methods:

To determine the dominance of the criteria determined based on Equation (1) and Equation (2), which is described by a function a and function b, if function a is greater than function b, it will give a strong difference value, or vice versa will give a weak value. The difference between each function is determined by the dimensions d. thus if d is less or equal to zero, then d will be zero and if the value of d is greater or equal to zero, then d will be worth one (Brans JP and Vincke Ph, 1985).

$$\left.\frac{\forall a^,b\in A}{f(a),f(b)}\right\} \begin{matrix} f(a)>f(b)\Leftrightarrow aPb \\ f(a)=f(b)\Leftrightarrow aIb \end{matrix} \tag{1}$$

$$H(d) = \begin{cases} 0 \ if \ d \le 0 \\ 1 \ if \ d > 0 \end{cases} \tag{2}$$

Where:
$H(d)$ = the function of difference in criteria between alts
d = difference in criteria value$\{d = f(a) - f(b)$

$$\varphi(a,b) = \sum_{i=1}^{n} \pi_i P_i(a,b) : \forall a,b \in A \tag{3}$$

Where
$\varphi(a,b) = 0$, weak preference if $a < b$
$\varphi(a,b) = 1$, strong preference if $a > b$

The promethee-1 concept is an elimination process that can cause a number of data to be eliminated in the first stage of the included data set. The formula that can be used is in Equation (4).

$$\emptyset^+(a) = \frac{1}{n-1}\sum_{x \in A} \varphi(a,x) \tag{4}$$

Where:
$\varphi(a,x)\ refer\ to\ preferensi\ alternatif\ a\ as\ better\ then\ x$

The continuation of the second elimination process, which is a data processing technique through out ranking called entering flow, this section is still said to be the promethee-1 concept, where the process of eliminating data sets results in a decrease in the number of data sets, the formula used is listed in Equation (5).

$$\emptyset^-(a) = \frac{1}{n-1}\sum_{x \in A} \varphi(a,x) \tag{5}$$

Thus it will be found the promethee-2 stage where the calculation process can be done by finding the difference between the out ranking from leaving flow and the out ranking from the entering flow.

METHOD

The selection method using Promethee has the following steps 1) Initialization of the dataset with the intention of determining the feasibility of the dataset, 2) Normalizing the dataset to determine the location of the range of certain data in the dataset, 3) Determining preferences between sampling, 4) Aggregation of preference functions, 5) Determining the amount of leaving flow value which is part of the Promethee-1 concept completion technique, 6) Determining the amount of entering flow which is part of the promethee-1 concept completion technique where the results of leaving flow and entering flow is located in a separate position so that it is necessary to unite using 7) the net flow process, namely accumulating leaving flow and entering flow, this is what is called Promethee-2. The stages of the research method using Promethee can be seen in (Fig. 1) which is Promethee's algorithm.

Pay attention to a process shown in (Fig. 1), namely the Aggregate preference function, which is the most compact comparison of data that has been grouped into a two-dimensional matrix that has previously been carried out by the process of eliminating data compared to one another. Because it is still the first process of the promethee, it can be seen that the data is still divided into two parts into leaving flow and entering flow which proves that from the first stage of this process, the ranking system is carried out separately both in the leaving flow and in the entering flow.

The most important process of promethee is in the net flow process stage, where the data has been accumulated into one data and this is what is called the second stage promethee, from this stage of the process the data has been processed into a single decision which can be used as decision support. This process will be shown in the next stage which is described in detail with an example table in the form of a dataset to the elimination process as described. Thus, pay close attention to the discussion of the existing processes in this Promethee method.
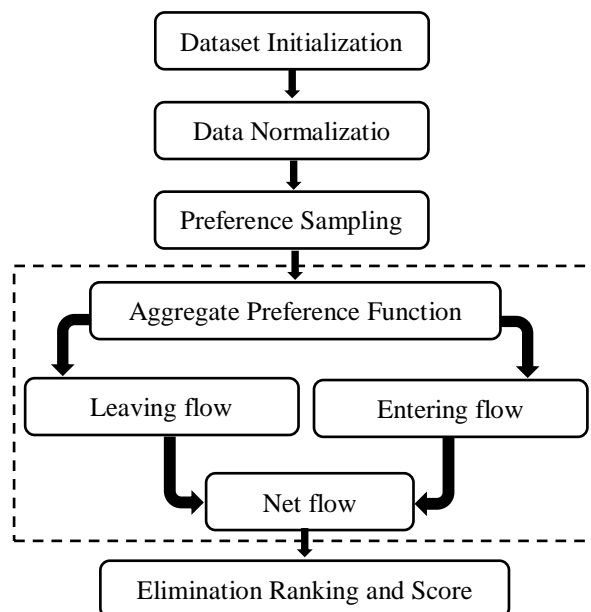

Fig. 1 Promethee Algorithm.

RESULT

By using the concept of the usual criterias, that the data to be processed is data in a simple form and the process carried out for all data input is proportional, thus none of the data being processed is contradictory. Therefore the equation must be done according to the steps listed in the Promethee algorithm. Pay Attention to (Table 1) which describes the research dataset.

Table 1
Application of Dataset

| Criteria | Aplication for UMKM Loan | | | | |
| | UMKM-1 | UMKM-2 | UMKM-3 | UMKM-4 | UMKM-5 |
	a	b	c	d	e
C1	4	4	4	4	4
C2	4	2	2	3	4
C3	2	2	4	3	1
C4	2	2	4	4	3
C5	3	4	3	1	4
C6	4	3	4	1	2

In (Table 1), it can be seen that there are five UMKM that are suitable alternatives for loans as business capital to develop UMKM in supporting economic progress in the lower to middle lines in the COVID-19 pandemic conditions as currently felt by UMKM. Meanwhile, there are a number of parameters that serve as a measure of assessment for UMKM which should be given and which ones are not appropriate not to be given. There are six criteria listed in (Table 2) as a barometer in the assessment as shown in the parameter of criteria table.

Table 2
Parameter of Criteria

Criteria	Meaning
C1	The ownership of KTP and KK
C2	Deed of Establishment and Deed of Amendment
C3	SK and Domicile Permit
C4	Length of effort
C5	Business productivity
C6	There is collateral

Thus the dataset which is used as an alternative can be processed consistently and fully with objective treatment which provides an overview of the Promethee method being able to consistently and objectively provide optimal weighting evidence at the end of the decision support process. Processing of the dataset using the usual criterion, which is described separately table by table as the intensity preference index, pay close attention.

Table 3
Fist table Intensity of Preferensi Index

| Criteria | (a,b) | | (b,a) | | (a,c) | | (c,a) | | (a,d) | |
	d	H(d)	d	H(d)	d	H(d)	d	H(d)	d	H(d)
C1	0	0	0	0	0	0	0	0	0	0
C2	2	1	-2	0	2	1	-2	0	1	1
C3	0	0	0	0	-2	0	2	1	-1	0
C4	0	0	0	0	-2	0	2	1	-2	0
C5	-1	0	1	1	0	0	0	0	2	1
C6	1	1	-1	0	0	0	0	0	3	1
	f(a,b)	0.333	f(a,b)	0.167	f(a,b)	0.167	f(c,a)	0.333	f(a,b)	0.500

Table 4
Second table Intensity of Preferensi Index

| Criteria | (d,a) | | (a,e) | | (e,a) | | (b,c) | | (c,b) | |
	d	H(d)	d	H(d)	d	H(d)	d	H(d)	d	H(d)
C1	0	0	0	0	0	0	0	0	0	0
C2	-1	0	0	0	0	0	0	0	0	0
C3	1	1	1	1	-1	0	-2	0	2	1

C4	2	1	-1	0	1	1	-2	0	2	1
C5	-2	0	-1	0	1	1	1	1	-1	0
C6	3	0	2	1	-2	0	-1	0	1	1
	f(d,a)	0.333	f(a,e)	0.333	f(e,a)	0.333	f(b,c)	0.167	f(c,b)	0.500

Table 5
Third table Intensity of Preferensi Index

Criteria	(b,d)		(d,b)		(b,e)		(e,b)		(c,d)	
	d	H(d)	d	H(d)	d	H(d)	d	H(d)	d	H(d)
C1	0	0	0	0	0	0	0	0	0	0
C2	-1	0	2	1	-2	0	2	1	-1	0
C3	-1	0	1	1	1	1	-1	0	1	1
C4	-2	0	2	1	-1	0	1	1	0	0
C5	3	1	-3	0	0	0	0	0	2	1
C6	2	1	-2	0	1	1	-1	0	3	1
	f(b,d)	0.333	f(d,b)	0.500	f(b,e)	0.333	f(e,b)	0.333	f(c,d)	0.500

Table 6
Fourth table Intensity of Preferensi Index

Criteria	(d,c)		(c,e)		(e,c)		(d,e)		(e,d)	
	d	H(d)	d	H(d)	d	H(d)	d	H(d)	d	H(d)
C1	0	0	0	0	0	0	0	0	0	0
C2	-1	0	-2	0	2	1	-1	0	1	1
C3	2	1	3	1	-3	0	2	1	-2	0
C4	2	1	1	1	-1	0	1	1	-1	0
C5	-3	0	-1	0	1	1	-3	0	3	1
C6	-1	0	2	1	-2	0	-1	0	1	1
	f(d,c)	0.333	f(c,e)	0.500	f(e,c)	0.333	f(d,e)	0.333	f(e,d)	0.500

The picture shown in (Table 3) until (Table 6) is actually in the form of a table where this condition cannot possibly be described in one unit because there are limitations in the way of exposure so that it is easily seen in real terms, so it must be presented separately. Based on the results obtained from (Table 3) until (Table 6) it can be arranged into two-dimensional matrices, which are called promethee 1 multi-criteria preference indexes, this is what forms decision support in separate conditions into leaving flow and entering flow , note (Table 7).

Table 7
Index Preference Multi-criteria.

Alternative	a	b	c	d	e
a		0.333	0.1667	0.500	0.333
b	0.1667		0.1667	0.333	0.333
c	0.333	0.500		0.500	0.500
d	0.333	0.500	0.333		0.333
e	0.333	0.333	0.333	0.5000	

With reference to (Table 7) so that it can be reduced to out ranking leaving flow and out ranking entering flow which is decision support to be separated, note (Table 8) and (Table 9) below.

Table 8
Out ranking Leaving flow

Alternative	Result	Ranking
a	0.333	4
b	0.250	5
c	0.458	1
d	0.375	2
e	0.375	3

Out ranking leaving flow is one of the determinants that can position an alternative whether to be excluded or not. This condition can be seen from the results obtained, whether positive or negative. Usually at this stage it is

always a positive value which illustrates that in the first stage the promethee can only determine the ranking system and determine from decision support tailored to the needs of alternatives that can be selected in decision-making support.

Table 9
Out ranking Entering flow

Alternative	Result	Ranking
UMKM-1	0.292	4
UMKM-2	0.417	2
UMKM-3	0.250	5
UMKM-4	0.458	1
UMKM-5	0.375	3

Out ranking Entering flow provides an illustration that the resulting weighting technique provides a clue at what level each alternative is placed, this is identical to the out ranking leaving flow. So that decision support needs that exist in conditions like this can only be decided by decision makers who are taken from the highest position to the lowest position where the amount of needs is adjusted by many factors that refer to efficiency, for example economy, the value of expenses in the form of costs and so on. With both the results that have been obtained, both leaving flow and entering flow. The next stage is to determine which ones should be given and which should not be given to UMKM in providing assistance. This stage is carried out by calculating a process called net flow, this is a decision maker called the promethee stage 2. The results obtained in determining the amount of net flow should be noted (Table 10) below.

Table 10
Final Out ranking Net flow

Alternative	Result	Ranking	Conclusion
UMKM-1	0.042	2	Received
UMKM-2	-0.167	5	*Rejected*
UMKM-3	0.208	1	Received
UMKM-4	-0.083	4	*Rejected*
UMKM-5	0.000	3	Received

The results obtained from the final out ranking net flow, are the basis for drawing conclusions that must be made, where there is a negative and positive score which means that a number of UMKM are accepted or rejected, This condition can be used as decision support in determining decisions optimal and consistent.

DISCUSSION

From the results that have been done, it has been optimal in making decisions on the selection and evaluation process at UMKM using the simplest concept, because the use of methods does not vary with the resulting data set. The comparison of linear data is indeed somewhat different from data that is inversely proportional, the meaning that there are datasets that are worked on in the context that the best is the largest or the best is the smallest data, so there will be differences in the formulation of using the formula. To determine the layout of a data value, you must first determine the largest value and the smallest value, then determine the interval at which a value must be placed in the formation of the dataset.

CONCLUSION

The final result of a research project on the selection and evaluation process is to determine a number of alternatives in accordance with the desired objectives, namely the decision maker. In this case, it is determining from a number of alternatives in the form of giving or not giving loans to UMKM to develop and continue their business during the current Covid 19 pandemic conditions. The decision taken from the results of the process using the Promethee method is the weight obtained from UMKM towards providing capital loans for their business development, seen from the highest weighting value for UMKM 3 with a value of 0.208, followed by UMKM-1 with a value of 0.024 and finally UMKM-5 with a weight the value is not negative and in the criteria it is still positive, while for the other two UMKM, namely UMKM-2 and UMKM-4 it is not appropriate to be given a capital loan because the weighting of the requirement values is negative so that it leads to decision support in a rejected condition.

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