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Decision Support System for Millennial Generation Softskill Competence Assessment Using AHP and Eliminate Promethee Methods Akmaludin1)\*, Erene Gernaria Sihombing 2), Linda Sari Dewi3), Rinawati 4), Ester Arisawati 5) 1)2)3)4)5)Universitas Nusa Mandiri, Jakarta, Indonesia 1)akmaludin.akm@nusamandiri.ac.id, 2)erene.egs@nusamandiri.ac.id, 3)linda.lrw@nusamandiri.ac.id, 4)rinawati.rlw@nusamandiri.ac.id, 5)ester.err@nusamandiri.ac.id Submitted : xxxxx | Accepted : xxxx | Published : xxxxx

Abstract: The current millennial generation has the soft skills needed **to be able to** follow the trends and technology of the industrial generation 4.0. It is clear that many Millennials look more energetic and always synergistic with destructive situations and conditions.

Industry 4.0 generation makes the business world switch to always using advanced technology in various sectors, so that technological progress is felt faster than before and human power is starting to be replaced by machine power, robotics, and even artificial intelligence.

Thus, soft skills for the millennial generation are needed to get job opportunities in conditions where the need for human labor has begun to be eliminated in their work.

**The purpose of this paper is to** assess the soft skills competencies possessed by the millennial generation who are always involved with technological advances in **the very fast business industry world.**

There are eight soft skills that the millennial generation must possess, namely critical thinking, communication, analyzing, creative and innovative, leadership, adaptation, cooperation and public speaking. The method used to select soft skills competencies for job opportunities for **the millennial generation is the Analytic Hierarchycal Process (AHP)**

method in collaboration with the Promethee elimination method.

The final result of the decision support for softskill competency selection from 23 millennial generations, who passed the selection were 43% (10 user) with a positive score and 57% (13 user) who experienced selection failure. This failure was due to having a negative score. Thus, the collaboration of the AHP and Promethee Elimination methods can provide optimal results for decision-making support.

Keywords: AHP, Millennial Generation, Promethee Elimination, Softskill, Selection.

INTRODUCTION The current millennial generation must always be in line with technological developments and advancements, especially the industrial 4.0 generation (Technologies, 2014). Because the habits of the millennial generation really are time to follow the very rapid technological advances (Sataloff et al.,

2017). Thus they have habits that become routine habits to try and use all forms of renewable technology, so it is very different from the previous generation which can be said to be technological stutterers (Rapitasari, 2016).

The millennial generation was born to keep up with the progress of the industrial business world (Vongsavanh & Campbell, 2008) that uses sophisticated technology that will eliminate the need for human labor and replace it with robotics, machine power, and even the use of technology that leads to artificial intelligence (Rojko, 2017).

With the change in the need for human power which is replaced with machine and robotic power, so that the millennial generation must be able to have soft skills (Lahope et al., 2020) that are able to control the machine and robotic power through increasing soft skills competence (Islami & Ferdinand, 2012). Progress is following technological trends in the millennial generation and in line with this, it can be seen that Hardskill abilities can be said to be fulfilled and a lot of knowledge has been obtained through the use of renewable technology and has become a habit for the millennial generation (Lie & Darmasetiawan, 2017), but advantages in the field of softskill competencies still need to be done.

increasing their knowledge and insight to balance their hard skills so that there can be a balance between hard skills and soft skills that are coupled will be a strength that every true millennial generation has (Jafar & Wahyuni, 2016). Regarding the soft skills that the millennial generation must possess (Arnata & Surjoseputro, 2014), there are eight soft skills to be able to exist in the millennial generation, namely critical thinking (Changwong et al.,

2018), communication, analyzing, creative and innovative, leadership, adaptation, cooperation, and public speaking. The selection technique for soft skills competencies can be done using the Analytic Hierarchy Process (AHP) method (Chybowski et al., 2016) which will be collaborated with the Promethee Elimination method (Ghazinoory et al., 2013).

These two methods can indeed be collaborated to get optimal decision support. AHP is used to determine the value of the weight of each criterion used (Mareschal & Smet, 2009), in this study the criteria used were eight criteria that would be processed using AHP. The AHP calculation process in giving the weight value of each criterion is based on the optimal eigenvector value .

This optimal eigenvalue in the search process using the AHP method (Brunelli et al., 2013) will be repeated several times to get the optimal value, the repetition process is used to shrink the differences received in data entry from a number of respondents through questionnaire instrumentation.

After finding the optimal eigenvector results, then this value can be used as a reference after the normalization process carried out by the promethee elimination method (Kamble et al., 2018), by simply multiplying the optimal eigenvector value after going through the iteration process multiplied by the weight of the dataset that has passed the normalization process, so the result is called the weighted normalization term.

Then it will be fully processed using the Promethee method through the stages such as index preference which will compare each data row index with the data index that has been set, and must be carried out thoroughly from the dataset owned (Aan et al., 2017), building two-dimensional matrices to determine the entering flow, leaving flow , and netflow (Maity & Chakraborty, 2015).

to establish a ranking table that is the basis for decision support to determine who gets a positive score will be accepted, while those who get a negative score will be rejected. LITERATURE REVIEW 2.1. Analytic Hierarchycal Process (AHP). The use of the Analytical Hierarchy Process (AHP) method that will be applied in this research is to determine the proportional value determined based on the magnitude of the eigenvector value (Saaty, 2003) which is carried out iteratively to obtain the optimal value (The et al., 1936).

The calculation process is carried out with algebra matrices with repetition several times so that it can be used as a reference for each of the criteria set. AHP can be used to determine rankings that use the one-way concept, meaning that only to determine the largest value that is ranked first, thus AHP is only able to handle problems that are

one-way, and cannot be applied to process data that is inversely proportional.

Proving the results applied with AHP can be verified using a special application, namely Expert Choice (Ishizaka & Labib, 2009). This application works automatically only by performing the same input process as inputted through the algebra matrices method. The results obtained through algebra matrices are looking for the magnitude of the eigenvector value, as well as the same process carried out with the Expert Choice application to find the magnitude of the eigenvector result. Of course, the results obtained have values that are identical to each other.

If so, these results are extraordinary results in proving the two methods, both the algebra matrices method and the method through the Expert Choice application. To use the layout of data elements with the algebra matrices method using two-dimensional matrices as shown in (equation-1) which describes the layout of each data element matrices and to determine the magnitude of the eigenvector value must be associated with the random index value listed in (table -1) and its use is adjusted to the number of orders used for the matrices calculation process.

The AHP calculation process that has been carried out through the algebra matrices method must always be proven by the feasibility of the process whether it is accepted or rejected, namely by knowing the amount of the Consistency Ratio (CR) value which is not more than ten percent, with the formula listed in (equation-3). Before looking for the CR value, you must first determine the amount of the Consistency Index (CI) value using the formulas listed in (equation-2) and lambda max (?? max).

This proof can be done by multiplying the initial pairwise matrices with the optimal eigenvector value and the result of this multiplication is **used to determine the** quantity  $(\sum_{j=1}^n \lambda_j)$  where the multiplication result is divided by the eigenvector value, then proceed to find the CI and CR quantities.  $\lambda_j = \frac{1}{n} \sum_{i=1}^n \frac{a_{ij}}{w_j}$  (1,1) (2,1) (3,1) (1,2) (1,3) (2,2) (2,3) (3,2) (2,4) ... (1,?) ... (2,?) ... (3,?) ? ? ? ? (??,1) (??,2) (??,3) ... (??,?) (1) In (equation-1) this provides an overview of the layout of the matrices elements as the original form of the first pairwise matrices, because in the calculation of the Multi-criteria Decision Making (MCDM) pairwise matrices method (Akmaludin et al., 2020), the process of repetition will occur repeatedly until there is no difference in value.

the last eigenvector with the previous eigenvector value. This means that the optimal eigenvector value has been found. This is done so that it can be used as an applied form of weighting a number of criteria that will be used as a continuation of the value weights that will be used in the Promethee method.

Meanwhile (equation-2) to find the Consistency Index (CI) that can be used after getting the value ( $\lambda_{max}$ ), where the value obtained by ( $\lambda_{max}$ ) is usually not far from the number of orders used, meaning that the value ( $\lambda_{max}$ ) is always close to the value of the order of matrices with a range value that is not far from the number of orders of matrices.  $CI = (\lambda_{max} - n) / (n - 1)$  (2)  $RI = \frac{CI}{\lambda_{max}}$  (3) Table 1 Random Index / 2.2.

PROMETHEE The use of the Promethee method is often used to determine ratings that can be applied with two completion concepts, the first solution is to resolve the data listed in the normalized dataset which has the largest perception of data is the best data (Akmaludin & Badrul, 2018), and the second solution is that the data listed in the normalized dataset has the perception of data smallest is the best data.

Even for these two perceptual processes can be used simultaneously which can be enhanced by the combination of perceptions together from the source dataset that has been normalized. Promethee is very extraordinary in terms of the calculation process (Deshmukh, 2013), promethee is able to process data with various conditions, and is usually used to deal with economic problems in determining the ranking of a number of alternatives used.

With the Promethee method, to carry out the normalization process, different formulations can be used by paying attention to the data processing, for data processing that uses two perceptions as described above, if it contains the perception that the largest value is the best value and the smallest value is the best value, use the formula can be done using (equation-4) and (equation-5).

This is done for different meanings, but if the processed data contains only one perception, meaning that the data is directly proportional to each criterion that has the same meaning as the following, the largest value is the best value, then the use of formulas can be done only by using formulas. listed in (equation-6).  $P_j = \frac{1}{n} \sum_{i=1}^n (P_{ij} - P_{ji})$  (4)  $P_j = \frac{1}{n} \sum_{i=1}^n (P_{ij} - P_{ji})$  (5)  $P_j = \frac{1}{n} \sum_{i=1}^n (P_{ij} - P_{ji})$  (6) Another formula used for the Promethee method is the process of using the concept of elimination on normalized datasets that have been given weighting criteria or not.

In this study using the preference weights obtained previously using the AHP, thus must use the weight of the criteria multiplied by the promethee preference index between samples using the formula listed in (equation-7). Thus, the role of the final process is to compile a preference index table to find out the amount of the entering flow value that can be found using the formula contained in (equation-8) and determine the value of

the leaving flow using the formula listed in (equation-9) , where between the entering flow and leaving flow which describes the shape of the promethee-I in a separate decision. As a basis for calculating promethee-II.

To combine separate decisions, you can use the formula contained in (equation-10) where the decision becomes unanimous by determining the amount of net flow value as a solution to the problem with the Promethee-II concept as a unifying decision value.

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(?, ? ' ) = ?? - 1 ?? ?? ?? ?? ?? ??(?, ? ' ) (7) F + (??) = 1 (1-??) ??=1 ?? ?? (??,??) (8) F - (??) = 1 (1-??) ??=1 ?? ?? (??,??) (9) F (??) = F + (??) - F - (??) (10)

METHOD The process of understanding a Promethee method can be explained by using an algorithm that can explain in detail the stages of the process carried out using the Promethee method.

It is indeed very difficult to follow the stages of the process using the Promethee method, because this study will prove the collaboration between the AHP method and Promethee with the concept of elimination. AHP is used to determine the preference for weight values on the criteria used, while the Promethee method is used to carry out the elimination process as a form of determining the ranking process.

The **collaboration of the two methods** occurs at the time of determining the normalization that has been determined by the amount of preference from the AHP method which becomes weighted normalization. For a clear picture, consider (figure-1) which is the algorithm of the transfer of the AHP method into the process using the Promethee method.

Figure 1 Promethee Algorithm. RESULT The millennial generation is a generation that is already good at adjusting the progress of all forms of technology, because the millennial generation is in line with technological trends in the era of the industrial revolution 4.0, thus the millennial generation, like it or not, like it or not, must follow the current that is developing towards the advancement of industrial 4.0

technology which is so rapidly. The millennial generation must have soft skills that must be possessed by every user who is generated. Some of the minimum soft skills that a millennial must have, there are eight soft skills as follows: (1) Critical thinking, (2) Communication, (3) Analyzing, (4) Creative and Innovation, (5) Leadership, (6) Adaptation, (7) Cooperation, and (8) Public Speaking. These are the soft skills that a millennial generation must have.

Pay attention to the soft skills listed in (table-2) as a form of using the acronym in the AHP method. Of the  $\pm 120$  number of respondents who became the input source as a preference for questionnaire instrumentation that was ready to be obtained using the

AHP method to determine the optimal eigenvector value through mathematical algebra matrices and the results can also be referenced using the Expert Choice application to prove the eigenvector value which is identical to the results obtained. obtained by mathematical algebra matrices.

This is done as evidence that the optimal eigenvector value can be accepted as a form of continuing research. As seen in (table 4) as pairwise matrices of the criteria which are the results of calculations using mathematical algebra matrices, the process that occurs in (table 4) occurs with five iterations to get the optimal eigenvector and the Consistency Ratio (CR) value is less than ten This percent means that the results obtained are acceptable, with a weighted value of CR = 0.048 (Acceptable).

Thus the optimal eigenvector value can be used as a preference to be used in the Promethee method for the process stages. Table 3 Acronym of criteria No. \_Acronym \_Criteria \_1 \_CT \_Critical Thinking \_2 \_CM \_Communication \_3 \_AN \_Analyzing \_4 \_CI \_Creative and Innovation \_5 \_LS \_Leadership \_6 \_AD \_Adaptation \_7 \_CP \_Cooperation \_8 \_PS \_Public Speaking \_ \_ Table 4 Pairwise matrices of Criteria Criteria \_CT \_CM \_AN \_CP \_CI \_LS \_CP \_PS \_Eigenvector \_Critical Thinking (CT) \_1.000 \_2.063 \_2.153 \_3.172 \_4.217 \_3.026 \_4.218 \_4.024 \_0.279 \_Communication (CM) \_0.485 \_1.000 \_1.956 \_2.184 \_3.347 \_3.272 \_4.053 \_3.224 \_0.206 \_Analyzing (AN) \_0.464 \_0.511 \_1.000 \_2.474 \_2.056 \_3.147 \_3.214 \_3.266 \_0.161 \_Creative and Innovative (CI) \_0.315 \_0.458 \_0.404 \_1.000 \_1.324 \_4.029 \_2.184 \_3.256 \_0.116 \_Leadership (LS) \_0.237 \_0.299 \_0.486 \_0.755 \_1.000 \_1.336 \_2.055 \_2.286 \_0.079 \_Adaptation (AD) \_0.330 \_0.306 \_0.318 \_0.248 \_0.749 \_1.000 \_2.162 \_1.224 \_0.062 \_Cooperation (CP) \_0.237 \_0.247 \_0.311 \_0.458 \_0.487 \_0.463 \_1.000 \_1.976 \_0.051 \_Public Speaking (PS) \_0.249 \_0.310 \_0.306 \_0.307 \_0.437 \_0.817 \_0.506 \_1.000 \_0.045 \_? max = \_8.477 \_ \_ \_ Consistency Index (CI) = \_0.068 \_ \_ \_ \_ \_ Consistency Ratio (CR) = \_0.048 \_ \_ \_ The results obtained for the optimal eigenvector values using mathematical algebra matrices can also be proven by using the Expert Choice application as a comparison to the optimal eigenvector results that have been obtained, note (table 5) as the entry form and the process applied in the Expert Choice application, while (Figure 2 ) is the final result of the optimal eigenvector obtained through the Expert Choice application.

The results obtained have the same value as the acquisition using Mathematical algebra matrices. Table 5 Pairwise matrices using Expert Choice Application / / Figure 2 Optimal eigenvector using Expert Choice application Proceeding to the promethee process stage which begins with a dataset view which is the result of data collection consisting of twenty-three millennial degeneration who will be selected for the world of work in accordance with their experience and understanding of technological trends and are able to master the industry 4.0



generation according to their habits have understood. The selection process carried out using the Promethee method is the mastery of soft skills owned by the millennial generation who have been selected in terms of mastering their hard skills.

For the refinement of the millennial generation, their soft skills will be tested, whether they are capable and have perfection, especially in terms of mastering soft skills. The results of the dataset view obtained from a number of millennial generations to be selected can be seen in (table 5) which consists of 23 millennial generation users who are ready to be selected, while the normalization results use (equation 4) or (equation 6).

Tabel 6 Dataset view Criteria _CT _CM _AN _CI _LS _AD _CP _PS _ (Alt) _ _ _ _ _																																																																																																																																																																																																																								
_GM01	85.72	82.72	80.27	84.43	85.91	89.76	83.63	79.92	_GM02	87.43	83.02	80.33	85.45	88.03	86.33	83.69	81.81	_GM03	97.83	90.21	80.07	80.67	87.03	86.92	83.43	79.01	_GM04	94.83	94.22	81.87	78.63	87.27	88.36	85.23	74.72	_GM05	96.78	84.90	79.45	86.23	89.01	84.30	82.80	85.60	_GM06	91.78	85.85	82.79	88.23	88.95	93.10	86.16	86.71	_GM07	83.27	87.63	84.82	86.25	89.33	88.95	88.20	81.94	_GM08	95.05	89.33	84.87	86.11	88.17	87.95	88.25	82.57	_GM09	95.83	91.85	83.09	84.23	86.08	83.41	86.46	80.70	_GM10	98.83	90.80	78.68	85.98	89.14	82.94	82.03	83.58	_GM11	89.94	81.47	81.53	87.71	88.11	83.92	84.89	85.51	_GM12	90.50	88.77	85.15	84.73	87.02	87.05	88.53	79.77	_GM13	93.84	86.13	85.68	84.82	88.01	82.54	89.06	81.42	_GM14	90.61	87.93	84.97	86.02	90.81	83.07	88.35	83.51	_GM15	88.38	79.52	79.69	86.12	89.07	85.25	83.04	81.92	_GM16	89.05	71.22	81.68	88.79	88.83	81.94	85.04	87.21	_GM17	81.25	75.87	77.69	81.77	86.93	81.93	95.47	83.57	_GM18	85.83	89.57	81.56	83.94	87.12	83.45	84.92	73.54	_GM19	90.80	89.83	85.16	85.92	88.01	82.06	88.54	85.52	_GM20	92.10	95.75	82.97	84.75	88.02	81.87	86.34	75.45	_GM21	91.54	77.63	84.05	89.93	88.51	81.10	87.42	85.63	_GM22	87.81	87.04	85.93	85.47	86.09	84.38	89.31	81.67	_GM23	88.49	87.29	86.67	81.30	87.13	85.27	90.06	80.60	Table 7 Normalization Criteria _CT _CM _AN _CI _LS _AD _CP _PS _ (Alt)									
	0.279	0.206	0.161	0.116	0.079	0.062	0.051	0.045	_GM01	0.25	0.47	0.29	0.51	1.00	0.72	0.12	0.47	_GM02	0.35	0.48	0.29	0.60	0.57	0.44	0.12	0.60	_GM03	0.94	0.77	0.27	0.18	0.77	0.49	0.10	0.40	_GM04	0.77	0.94	0.47	0.00	0.72	0.61	0.24	0.09	_GM05	0.88	0.56	0.20	0.67	0.37	0.27	0.06	0.88	_GM06	0.60	0.60	0.57	0.85	0.38	1.00	0.31	0.96	_GM07	0.11	0.67	0.79	0.67	0.30	0.65	0.46	0.61	_GM08	0.78	0.74	0.80	0.66	0.54	0.57	0.46	0.66	_GM09	0.83	0.84	0.60	0.50	0.97	0.19	0.33	0.52	_GM10	1.00	0.80	0.11	0.65	0.34	0.15	0.00	0.73	_GM11	0.49	0.42	0.43	0.80	0.55	0.24	0.21	0.88	_GM12	0.53	0.72	0.83	0.54	0.77	0.50	0.48	0.46	_GM13	0.72	0.61	0.89	0.55	0.57	0.12	0.52	0.58	_GM14	0.53	0.68	0.81	0.65	0.00	0.16	0.47	0.73	_GM15	0.41	0.34																																																																															



\_0.22 \_0.66 \_0.36 \_0.35 \_0.08 \_0.61 \_ \_GM16 \_0.44 \_0.00 \_0.44 \_0.90 \_0.40 \_0.07 \_0.22  
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 \_GM20 \_0.62 \_1.00 \_0.59 \_0.54 \_0.57 \_0.06 \_0.32 \_0.14 \_ \_GM21 \_0.59 \_0.26 \_0.71 \_1.00  
 \_0.47 \_0.00 \_0.40 \_0.88 \_ \_GM22 \_0.37 \_0.64 \_0.92 \_0.61 \_0.96 \_0.27 \_0.54 \_0.59 \_ \_GM23  
 \_0.41 \_0.66 \_1.00 \_0.24 \_0.75 \_0.35 \_0.60 \_0.52 \_ \_ The next stage is to determine the  
 preference index which is taken with 506 comparisons that have been made, to find out  
 which data are eliminated and which are not.

On the other hand, it is in line with whether it is eliminated or not after being operated  
 with the amount of preference that has been obtained using the AHP method through  
 its optimal eigenvector. The results are arranged in the form of two-dimensional matrices,  
 as a determinant as support for decision making which can be seen in (table 8) which is  
 compiled in the form of a preference index matrices.

There are totals on the right and bottom of (table-8) for the totals listed on the right will  
 explain the leaving flow, while the totals listed on the bottom will explain the entering  
 flow, of the two being separate decisions and will be integrated into a unified decision,  
 this condition is called the first stage promethee. The unification of the decision is called  
 net flow which can be said as the second stage promethee, meaning that the decision  
 can be used as decision support.

So that the discussion on this promethee has become in accordance with the stages of  
 the algorithm. Table 8 Index preferensi matrices / -----  
 \_ Mengacu pada (table 8) merupakan tahapan akhir untuk menentukan besaran nilai  
 dari masing-masing alternative yang merupakan generasi millennial yang berjumlah dua  
 puluh tiga peserta seleksi terbaik untuk melakukan pemilihan manakah dari generasi  
 millennial yang berhasil lolos seleksi terhadap kemampuan softskill yang dimiliki oleh  
 para generasi millennial ini. Hasil akhir dapat dilihat pada (table 9).

Bentuk table sudah dalam kondisi tersortir agar terlihat mudah untuk dipahami,  
 alternative dari para generasi millennial yang mana yang diterima dan mana yang  
 ditolak dengan melihat kolom status. Table 9 Gaining of Leaving Flow, Entering Flow,  
 Net Flow and Promethee Ranking / DISCUSSIONS The promethee method can indeed  
 be used as a selection for each problem, whether the criteria are in line, meaning that  
 they are directly proportional, or those that are inversely proportional.

If you use each criterion without using preferences through the optimal eigenvector of  
 the AHP method, of course the results will give different values, it's different if you use  
 preferences through the optimal eigenvector of course the decision results will be

influenced by the optimal eigenvector preferences. It is necessary to discuss how the determination of preferences, if not done with AHP, will be seen in the decision support obtained.

It's cool if you don't use optimal eigenvectors through the AHP method, of course you won't be objective about the resulting decision support. CONCLUSION Referring to the results of the decisions obtained on the soft skills competencies possessed by the millennial generation, that of the twenty-three millennial generation alternatives selected, there were ten millennials who passed the selection using the collaboration method between AHP and Promethee, while those who failed the selection were thirteen millennial generations who passed the selection process. eliminated by the Promethee method.

The results of the selection and evaluation of softskill competencies, the first, second, and third ranks were respectively favored to GM08, GM09, GM06. The selection of rankings can be adjusted to the needs of the millennial generation who will be accepted, of course with reference to acceptable status, of course, how many people from the millennial generation have been declared as accepted status.

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