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Multi Criteria Decision Making for the Preparation of Sustainability Indicators for the Printing Sector Industry

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Abstract. The government encourages industry players to continue to innovate and be sustainable in accordance with the commitment of the Ministry of Industry of the Republic of Indonesia. Industrial sustainability itself requires careful planning such as indicators and strategy formulation. Currently, the large number of industries in various sectors has given rise to fierce competition. The printing industry sector was an industry with significant development of 10 percent since 2019-2024. The purpose of this study was to develop indicators of industrial sustainability that were implemented in the printing sector in Surakarta City. The methods used were the Delphi Method and the Multi-Criteria Decision Making (MCDM) Method. The respondents of this study were PT Margo Mitro Joyo and PT Putra Nugraha Sentosa. The results of the study can produce 22 indicators of industrial sustainability, while also determining the level of sustainability of the printing sector industry in Surakarta in the good category.

Keyword:
MCDM, sustainability, printing industry, indicator.

1. Introduction

Industrial sustainability can be defined as active concern for human resources, environmental resources, economy, institutions, products, gender equality, diversity, and business ethics [1]; [2]; [3]. Furthermore, industrial sustainability always relies on and adopts three areas or commonly also referred to as the Triple bottom line [4]. The triple bottom is made up of the environment, society, and economy. The economic field means putting the industry's well-being and productivity first; the social field means influencing the community and raising its standard of living; the environmental field means that the industry also considers the effects on the environment that will result from the operation of the business. Industrial sustainability is the capacity to endure in the face of economic, social, and environmental challenges [5].

Industry is a key component of the global economy [6] and a foundation of national economic growth [7]. The Association of Southeast Asian Nations (ASEAN) asserts that industry plays a significant role in each nation's economic structure and development [8]. In 2019, the ASEAN Federation of Accountants aimed to make industry the foundation of the national and regional economy [9]. Many policy officials, industry advocates, and other observers have advanced a view that is consistent with this remark [8]. According to [10], ASEAN itself said that industry is becoming a more significant influence in ASEAN's economic integration every year.

The size and importance of an economy are directly correlated with the vulnerability of sustainability and competition [5]; [11]. It is often difficult to understand, manage, and measure an industry [8]. This is determined by the stakeholders who manage an industry. The stakeholders in question are the government, industry owners, the community, and consumers. The more efficiently stakeholders are able to analyze, control, and evaluate problems in an industry, the more efficiently the industry can operate and drive economic growth [12].

The printing industry is one of the strategic and potential industrial sectors, considering its role in providing significant contributions to the economy in Indonesia. The contribution of the printing industry in Indonesia, such as employment absorption and increasing community income. The Ministry of Industry of the Republic of Indonesia reported that the printing sector is stable at 73.5% and is still growing rapidly from year to year [13]. Furthermore, the contribution of the printing industry to the country's economy is relatively large, amounting to IDR 110,562.3 billion, as evidenced in 2019 recorded GDP growth of 8.86% of the total national GDP growth of 5.02%, and in 2020 recorded GDP growth of 0.22% of the total national GDP growth of -0.27% [14]. In addition, investment in the printing industry in Indonesia is also high, with a value of USD 942.8 million for total foreign investment and IDR 3,745.9 billion for domestic investment. Based on these data, the government needs to support by providing attention and policies to the printing industry.

On the other hand, currently the many printing industries that exist have created increasingly tight competition. Competition in the printing sector industry is also increasingly complicated with the development of the digital era. The development of the digital era has an impact on technology, production methods, declining prices of the printing industry, and declining consumer interest in the printing industry. The printing industry currently only prints according to consumer demand or needs. Based on data from the Indonesian Publishers Association (IKAPI), there has been a decline in the growth rate of the publishing industry, including the printing industry. The growth rate in 2010 was 28.22% then decreased to -0.48% in 2017. Furthermore, in 2018 it was 7.38% then decreased to 4.20% in 2019. Furthermore, during the Covid-19 pandemic in 2020, the growth rate decreased significantly by -72.47% [14]. In the digital era, the printing industry is required to keep up with technological developments so as not to experience a decline in profits to the point of bankruptcy. Furthermore, the printing industry is also required to determine sustainability strategies in the digital era.

The Multi-Criteria Decision Making (MCDM) approach is one of the techniques that helps in decision making [15]. The results of this method can provide dual objectives, namely identifying indicators in industrial sustainability, evaluating industrial sustainability, and

determining tactics to overcome competition in the industry [2]. Multi-criteria decision making is a method developed to assess the benefits of reusing resources owned in developing countries based on three pillars of sustainability, namely social, economic, and environmental [16].

Currently, the application of industrial sustainability is adopted by various manufacturing industries throughout the country, both in developed and developing countries [17]. The application of industrial sustainability has several factors such as product type, industry size, and industry type [18]. Furthermore, the application of MCDM to industrial sustainability is a developing research area and still has many research gaps [16]. In an effort to support the application of MCDM in industrial sustainability and help overcome the research gap, the application of industrial sustainability is needed in various industrial sectors including the printing industry.

Based on the problems faced by the printing industry, namely the decline in the selling price of the printing industry, the decline in consumer interest in the printing industry, and the decline in the growth rate of the printing industry. On the other hand, there is a method, namely MCDM, which can identify indicators in industrial sustainability, evaluate industrial sustainability, and determine tactics to overcome competition in the industry. Furthermore, the application of MCDM to industrial sustainability is a developing research area and still has many research gaps. So, the purpose of this study is how Multi Criteria Decision Making for the preparation of sustainability indicators for the printing sector industry is implemented in the printing sector in Surakarta City.

2. Methodology

Industrial sustainability can be defined as concern for human resource management, community economy, participating institutions, industry products, gender equality, and environmental resource management [1]; [2]; [3]. Furthermore, industrial sustainability has three main pillars or what is commonly called the Triple bottom line as in Sustainable Development [4]. Industrial sustainability can also be interpreted as an important concept for an industry to minimize and manage the waste that the industry produces and efficiently use resources to achieve sustainable development goals (SDGs) [15]. The manufacturing process in an industry that prioritizes efforts for the effectiveness and efficiency of sustainable resource use in its production process is industrial sustainability.

Triple bottom consists of environment, society, and economy [19]. The economic field can include industrial productivity, economic role for the surrounding community, company income, product innovation, business development, and market position. The social field includes, labor impact, stakeholder participation, partnerships, wealth, expertise, culture community, fairness, resource use, employment of women, tools and services, poverty, and improving living standards. The environmental field includes the impact on the environment that will arise from its business operations, waste recycling facility, preservation, harmfulness, reduction in transportation, waste reduction, external greenhouse gas emissions, proportion of natural land [5].

The printing industry is a strategic industrial sector and has the potential to make a significant contribution to the country's economy. The printing industry is classified into 2, namely: the printing industry as a manufacturing industry and the publishing industry. More broadly, the printing industry can print products, such as books, newspapers, labels,

stationery, forms, business cards, and other materials. In the printing industry, it has a process that includes several methods such as transferring images or computer files to a medium, such as metal, plastic, paper, wood, or into textiles. Such a printing industry is also called a manufacturing industry [13].

The Multi-Criteria Decision Making (MCDM) approach is one of the techniques that helps in decision making [15]. The results of this method can provide two objectives, namely identifying indicators in industrial sustainability, evaluating industrial sustainability, and determining tactics to overcome competition in the industry [2]. Decision analysis in the manufacturing industry is a tool that can help solve problems with several alternative objectives, alternatives, and criteria. Decision making with multi-criteria consists of five bases, namely research objectives, expert preferences, available criteria, alternative solutions to problems, and research results. MCDM is also classified into three types, namely Multi-attribute decision making (MADM), Multi-objective decision making (MODM), and MADM-MODM collaboration [13].

This study focuses on the application of Multi Criteria Decision Making for the preparation of sustainability indicators in the printing sector industry, which is applied to the printing sector in Surakarta City. The research location for this study can be seen in Figure 1.

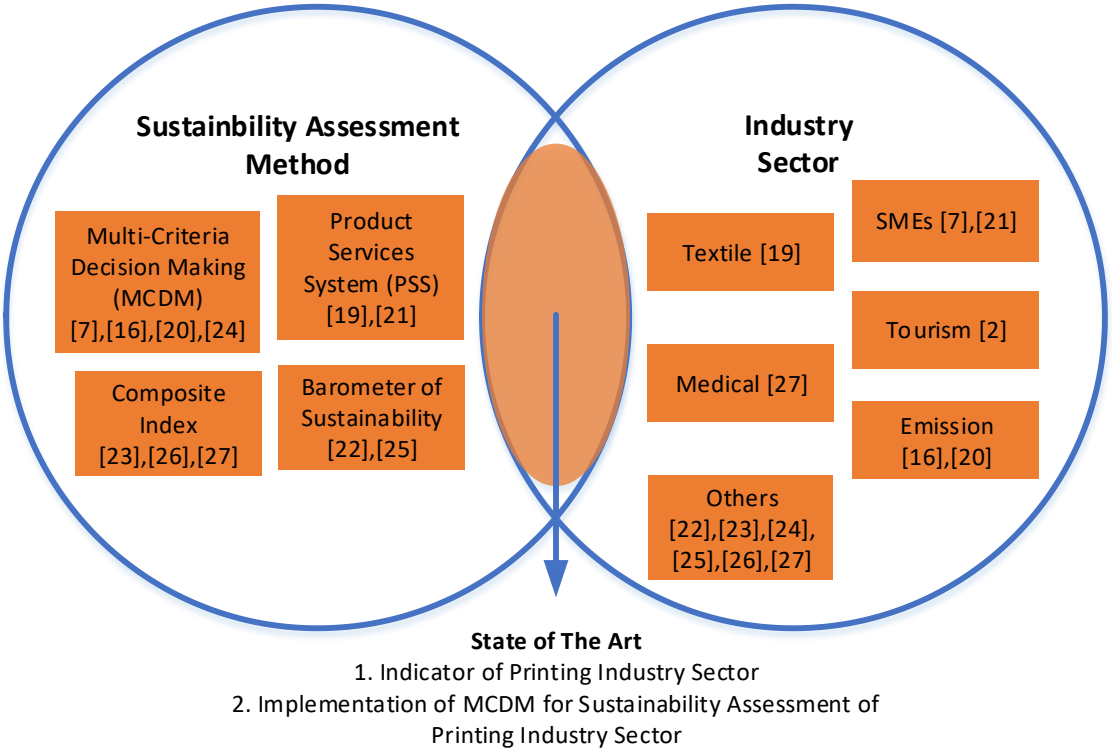

Figure 1. State of The Art

This study consists of five stages of research. Figure 2 is a diagram of the stages of research from the variable identification stage to data interpretation. The stages of the research consist of: stage 1 variable identification, stage 2 assessment tool modification, stage 3 data collection, stage 4 data processing, and stage 5 data interpretation.

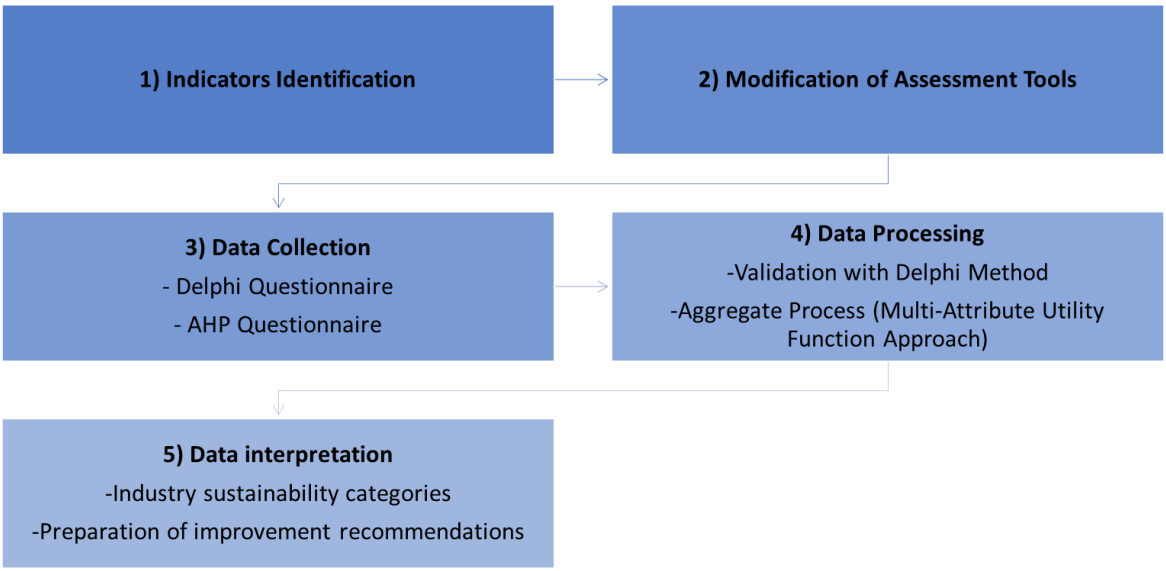

Figure 2. Research flow diagram

First stage. Identification of indicators, the indicator identification stage by collecting indicators based on previous research from various sectors in the industry. There are seven previous studies adopted for indicators to be used in the research on sustainability assessment of the printing industry. These indicators are divided into four dimensions, namely the economic dimension, the environmental dimension, the socio-cultural dimension, and the product integrity dimension. The sustainability assessment indicators of the printing industry can be seen in Table 1.

Table 1. Industrial Sustainability Indicators

No	Dimensions: Indicators
1	**Environment (L):** Materials employed, water consumed, energy expended, air pollutants, both solid and liquid by products, dangerous waste, optimization of system lifespan, waste recycling facility, preservation, harmfulness, reduction in transportation, waste reduction, external greenhouse gas emissions, proportion of natural land [20]; [21]; [22]; [23]; [24]
2	**Economic (E):** Revenues, capital investment, value added, infrastructure investment, financial risk, inflation, independent entrepreneurs, diversification process, product innovation, market position and competitiveness, profitability, business development, partnerships, macroeconomic effects, productivity in industry [20]; [21]; [25]; [26]; [24]
3	**Social Cultural (S):** Local community impact, employment of local talent, labor impact, stakeholder participation, partnerships, wealth, expertise, culturecommunity, fairness, resource use, employment of women, tools and services, poverty [20]; [21]; [25]; [26]; [24]
4	**Product Integrity (PI):** Environmental sustainability, inclusive business, employee well-being, product integrity, sustainable supply [20]; [21]; [25]; [26]; [24]

Second stage. Modification of the assessment tool, this stage by adjusting the assessment tool in the form of an assessment scale that will be used to determine the sustainability category of the printing industry into the good or bad category. The scale for determining the sustainability assessment category of the industry can be seen in Table 2.

Table 2. Sustainability Assessment Scale

No	Mark	Category
1	<0,55	Sustainability is lacking
2	0,56-0,65	Sustainability is enough
3	0,66-0,75	Good sustainability
4	0,76-1	Sustainability is very good

The third stage. Data collection, at this stage data collection from stakeholders in the industry. Data collection is carried out with the help of questionnaires and in-depth interviews for the Delphi Method, as well as weighted questionnaires for MCDM. Respondents in this study were companies that met the criteria, namely companies located in Surakarta City, companies that are included in the list of the Ministry of Industry, and companies that have a minimum workforce of 100 employees. Companies that meet these qualifications are PT Mitro Margo Joyo (Company A) and PT Putra Nugraha Sentosa (Company B). Respondents in data collection for the Delphi Method were experts in the printing industry (such as: leaders of printing companies, the surrounding community, and the government), while for MCDM they were stakeholders in the printing industry (such as: leaders of printing companies, the surrounding community, employees, and the government).

Fourth stage. Data processing, at this stage each indicator in the dimensions that have been collected is then validated and assessed for its level of sustainability. The data processing flow is as follows:

Indicator validation, validation is carried out using the two-round Delphi Method. The first round of the Delphi Method is used to find out which indicators can be used with a voting elimination system from experts, as well as to collect additional indicators proposed by experts. Furthermore, the results of the one-round Delphi Method are validated again with the second round Delphi Method which aims for final validation by experts. Only after that can the indicators be used for the next stage.

Indicator Weighting, weighting begins with Normalization (Min-Max Method), The step before normalizing the data is to change the Likert scale from the ordinal questionnaire results to intervals, this is done because the Likert scale based on ordinal cannot be subjected to mathematical operations. To change the ordinal scale to interval-based using the Successive Interval Method. The steps of the Successive Interval Method are to calculate the frequency of answers for each ordinal data, multiply the frequency by the ordinal value, calculate the proportion value and cumulative proportion of each indicator, calculate the Z value for each cumulative proportion (using the Microsoft Excel formula = NORMSINV), determine the Z value limit (probability function value on Z) for each category using (using the Microsoft Excel formula = NORMDIST), calculate the scale value of each indicator with the equation:

$$Scale = \frac{lower\ limit\ density - upper\ limit\ density}{area\ below\ upper\ limit - area\ below\ lower\ limit} \quad (1)$$

To calculate the score for each indicators use the following equation:

$$Score = scale\ value + |Scale\ value\text{min}| + 1 \quad (2)$$

The interval result data is then normalized using the min-max procedure, normalization with the min-max procedure is used because it expands the indicator range at small intervals [22],

the equation is as follows:

$$Iqc = \frac{xq - min(xq)}{max(xq) - min(xq)} \quad (3)$$

Where:

Iqc = data normalization results
xq = data to be normalized
min(xq) = smallest data
max(xq) = biggest data

Aggregation Process, aggregating indicators with a Multi-attribute utility function approach. Aggregation with a multi-attribute utility function approach is done using Microsoft Excel. The multi-attribute utility function approach is as follows: Determining the indicators to be used and investigating the independence of preferences or independence of utilities, Assessing the utility components of each indicator (from the results of data normalization), Assessing the scale factor by looking at the constant value (K) is an additive aggregation or multiplicative aggregation, Calculating the constant value (K), if K = 0 then the form of the addition function (additive), if the value of k ≠ 0 then multiplication is carried out (multiplicative), and Presenting the calculation results in the form of a radar diagram (such as the THIO Diagram).

The fifth stage. Data interpretation is done by analyzing valid indicators, indicator weights, and indicator values. Based on the indicator values and dimensions, the printing industry will be qualified into the good or bad category. Furthermore, based on the low indicator weights and high indicator values, proposals for improvements or recommendations for the printing industry strategy in the future will be formulated.

3. Results and Discussion

Based on the indicators collected from previous studies, there are 47 indicators consisting of 14 environmental dimensions, 15 economic dimensions, 13 socio-cultural dimensions, and 5 product integrity dimensions. Furthermore, these indicators were validated using the first round **Delphi method**, where there were 22 indicators declared valid, consisting of 7 environmental dimensions, 3 economic dimensions, 9 socio-cultural dimensions, and 3 product integrity dimensions. In the second round Delphi method, there were 22 indicators declared valid, which means that all indicators from the first round Delphi method were declared valid. Table 3. is an indicator of Industrial Sustainability along with its definition.

The indicators that have been validated in the two-round Delphi method, then the **indicator weight** is calculated using the Analytical Hierarchy Process (AHP) method. The results of the calculation show that all indicators are consistent (CR ≤ 0.1) and can be used for further calculations on MCDM for industrial sustainability in the printing sector. Table 4. is the weight for each indicator in Industrial Sustainability.

The results of **MCDM** show that the value of industrial sustainability based on 4 dimensions in **Company A** is known that the environmental dimension (L) obtained a value of 0.78, the economic dimension (E) obtained a value of 0.91, the social dimension (S) obtained a value of 0.88, and the product integrity dimension (IP) obtained a value of 0.67. So that the industrial sustainability value is 0.74 with the Good category. Figure 3 is a radar diagram to show the value of each dimension of industrial in Company A (see Figure 3).

Table 3. Industry Sustainability Level Indicator Codes

No	Indicator	Information
A.	**Environmental Dimensions**	
1	Environmental Management (L1)	Sustainable management of natural resources
2	Greenhouse Gases (L2)	Gas emissions used in companies that trigger global warming
3	Water Energy Efficiency (L3)	Efficient use of water and energy
4	Environmental Management System (L4)	Structured and sustainable environmental management
5	Waste Management System (L5)	Collection, sorting, recycling and disposal
6	Environmental Awareness (L6)	Understanding, concern, action to protect the environment
7	Environmental Sustainability (L7)	Sustainable wise use of resources
B.	**Economic Dimension**	
8	Partnership with suppliers (E1)	Strategic cooperation for shared sustainability
9	Community development (E2)	Empowering citizens for sustainable well-being
10	Women empowerment (E3)	Strengthen the role of women in all aspects
C.	**Social Dimension**	
11	Supplier Development (S1)	Sustainably improve supplier capacity and quality
12	Supplier Audit (S2)	Systematic assessment of supplier performance and compliance
13	Freedom of expression (S3)	The right to express opinions without hindrance
14	Forced labor practices (S4)	Work done without consent
15	Fair compensation (S5)	Payment according to contribution and responsibility
16	Diversity and equal opportunity (S6)	Respecting differences, providing equal opportunities
17	OHS regulations (S7)	Rules to ensure occupational safety and health
18	OHS management policies and systems (S8)	Guidelines and procedures for work safety
19	Employee training and development programs (S9)	Continuously improve employee skills and potential
D.	**Product Integrity Dimensions**	
20	Product Legislation (IP1)	Legal regulations regarding product standards and safety
21	Research and development (IP2)	Innovation to create solutions and progress
22	Product marketing (IP3)	Strategies for promoting and selling products to consumers

Furthermore, 1 indicator in four dimensions in Company A obtained a value of 0.50, namely Supplier audit (S2); 1 indicator obtained a value of 0.56, namely Research and development (IP2); 1 indicator obtained a value of 0.62, namely Supplier development (S1); 1 indicator obtained a value of 0.67, namely Community development (E2); 14 indicators obtained the same value, namely 0.69, namely Environmental Management (L1), Water Energy Efficiency (L3), Environmental Management System (L4), Waste Management System (L5), Environmental Concern (L6), Environmental Sustainability (L7), Freedom of expression (S3), Fair compensation (S5), Diversity and equal opportunity (S6), OHS

Regulations (S7), OHS management policies and systems (S8), Employee training and development programs (S9), Product legislation (IP1), Product marketing (IP3); 1 indicator obtained a value of 0.77, namely Partnership with suppliers (E1); as many as 3 indicators that obtained the same value of 1.00, namely greenhouse gases (L2), women's empowerment (E3), forced labor practices (S4). The results obtained based on interviews with company owners that Company A is very concerned about how to minimize the use of Air Conditioning (AC) by utilizing optimal ventilation, Company A also cares about the surrounding community as evidenced by involving the community around the company to be able to work in the company, and with the establishment of Company A in the community area can open businesses such as grocery stores and restaurants. Table 4. is the value for each indicator in Industrial Sustainability.

The MCDM results show the industrial sustainability value based on 4 dimensions in Company B, it is known that the environmental dimension (L) obtained a value of 0.69, the economic dimension (E) obtained a value of 0.61, the social dimension (S) obtained a value of 0.68, and the product integrity dimension (IP) obtained a value of 0.75. So that the industrial sustainability value is 0.71 with the Good category. Figure 3 is a radar diagram to show the value of each industrial desire dimension in Company B (see Figure 3).

Furthermore, 1 indicator in four dimensions in Company B obtained a value of 0.56, namely Partnership with suppliers (E1); 4 indicators obtained the same value of 0.62, namely Community development (E2), Women's empowerment (E3), Supplier development (S1), Supplier audit (S2); 16 indicators obtained the same value of 0.69, namely Environmental Management (L1), Greenhouse Gas (L2), Water Energy Efficiency (L3), Environmental Management System (L4), Waste Management System (L5), Environmental Concern (L6), Environmental Sustainability (L7), Freedom of expression (S3), Forced labor practices (S4), Fair compensation (S5), Diversity and equal opportunity (S6), OHS regulations (S7), OHS management policies and systems (S8), Employee training and development programs (S9), Product legislation (IP1), Product marketing (IP3); 1 indicator obtained a value of 1.00, namely Research and development (P2). The results obtained based on interviews with company owners show that Company B involves student interns to continue conducting research and providing input to the company, and there is an R&D division. Table 4. is the value for each indicator in Industrial Sustainability.

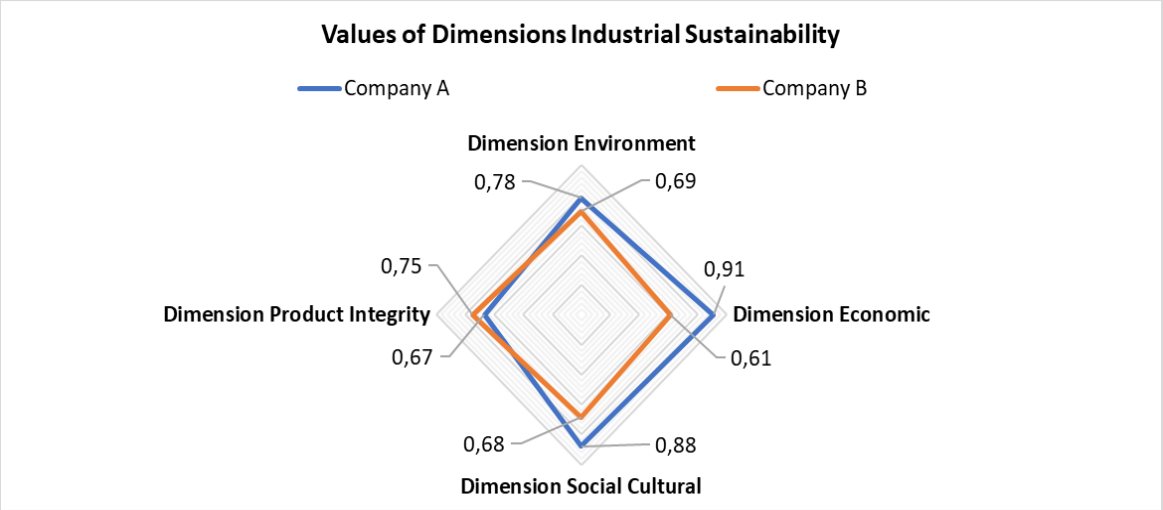

Figure 3. Values of Dimensions Industrial Sustainability Companies A and B

Table 4. Industry Sustainability Weight and Value

No	Code	Values		Weight
		Company A	Company B	
1	L1	0,69	0,69	0,05
2	L2	1,00	0,69	0,28
3	L3	0,69	0,69	0,06
4	L4	0,69	0,69	0,10
5	L5	0,69	0,69	0,07
6	L6	0,69	0,69	0,09
7	L7	**0,69**	**0,69**	**0,34**
8	E1	**0,77**	**0,56**	**0,20**
9	E2	0,67	0,62	0,13
10	E3	**1,00**	**0,62**	**0,67**
11	S1	0,62	0,62	0,11
12	S2	**0,50**	**0,62**	**0,05**
13	S3	0,69	0,69	0,02
14	S4	**1,00**	**0,69**	**0,65**
15	S5	0,69	0,69	0,00
16	S6	0,69	0,69	0,01
17	S7	0,69	0,69	0,03
18	S8	0,69	0,69	0,05
19	S9	0,69	0,69	0,07
20	PI1	0,69	0,69	0,15
21	PI2	**0,56**	**1,00**	**0,18**
22	PI3	**0,69**	**0,69**	**0,66**

*)bold = lowest value and high weight

Based on the calculation results, recommendations are compiled based on indicators that have low values and high weights. Figure 4 is a recommendation compilation diagram for Company A (see Figure 4). Figure 5 is a recommendation compilation diagram for Company B (see Figure 5).

In the **environmental dimension**, Company A and Company B have 1 indicator that needs to be proposed for improvement, namely Environmental Sustainability (L7). Where both companies have a value of 0.69 and a weight of 0.34. Thus, the recommendation for both companies is to utilize the potential of environmentally friendly alternative energy in nature to provide added value and minimize environmental pollution [27]; [28]; [29]; [30]. In addition, they also carry out natural revitalization with a program to plant a thousand trees [31]; [32] or Corporate Social Responsibility (CSR) together with the community and government to create a city forest [33]. Figure 4 is a diagram of the compilation of recommendations for Company A (see Figure 4). Figure 5 is a diagram of the compilation of recommendations for Company B (see Figure 5).

In the **economic dimension**, Company A and Company B have 2 indicators that need to be proposed for improvement. The first indicator is Partnership with suppliers (E1) which has a value of 0.77 for Company A, a value of 0.56 for Company B, and a weight of 0.20. The second indicator is Women empowerment (E3) which has a value of 1.00 for Company A, a

value of 0.62 for Company B, and a weight of 0.67. Thus, the recommendation for both companies is that the company should involve female workers in the company's administration [34]. Furthermore, both companies should hold supplier gathering activities or regular meetings with suppliers in order to establish more loyal cooperation [35]; [36]. Figure 4 is a diagram of the compilation of recommendations for Company A (see Figure 4). Figure 5 is a diagram of the compilation of recommendations for Company B (see Figure 5).

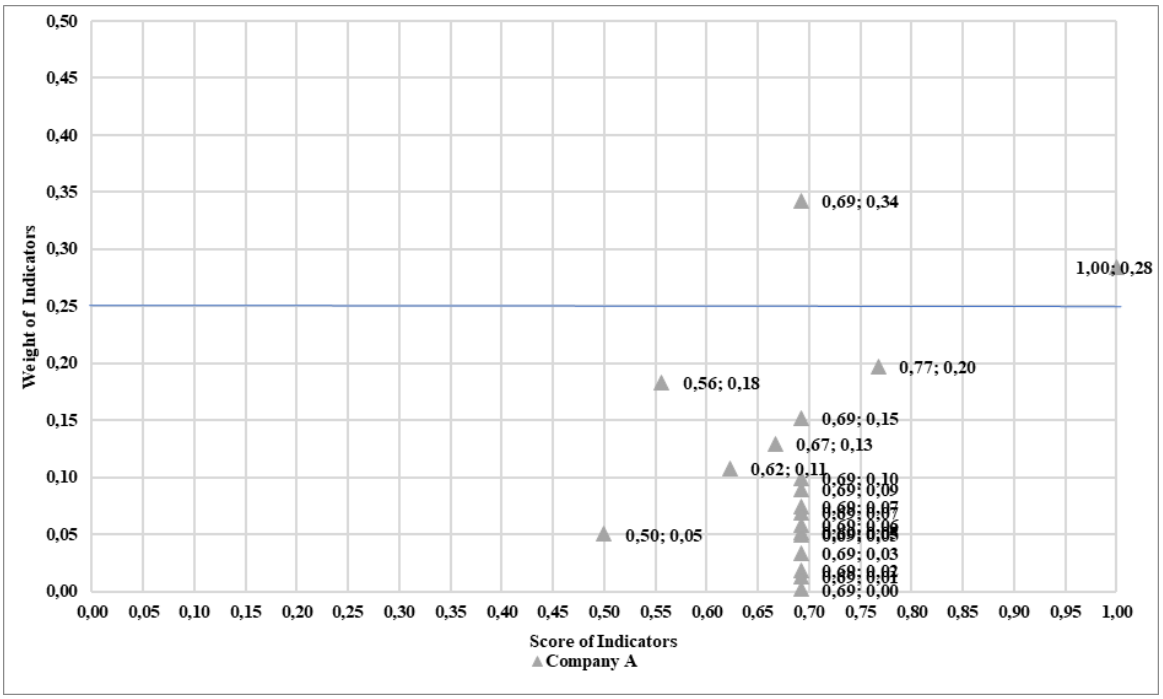

Figure 4. Matrix Recommendation Companies A

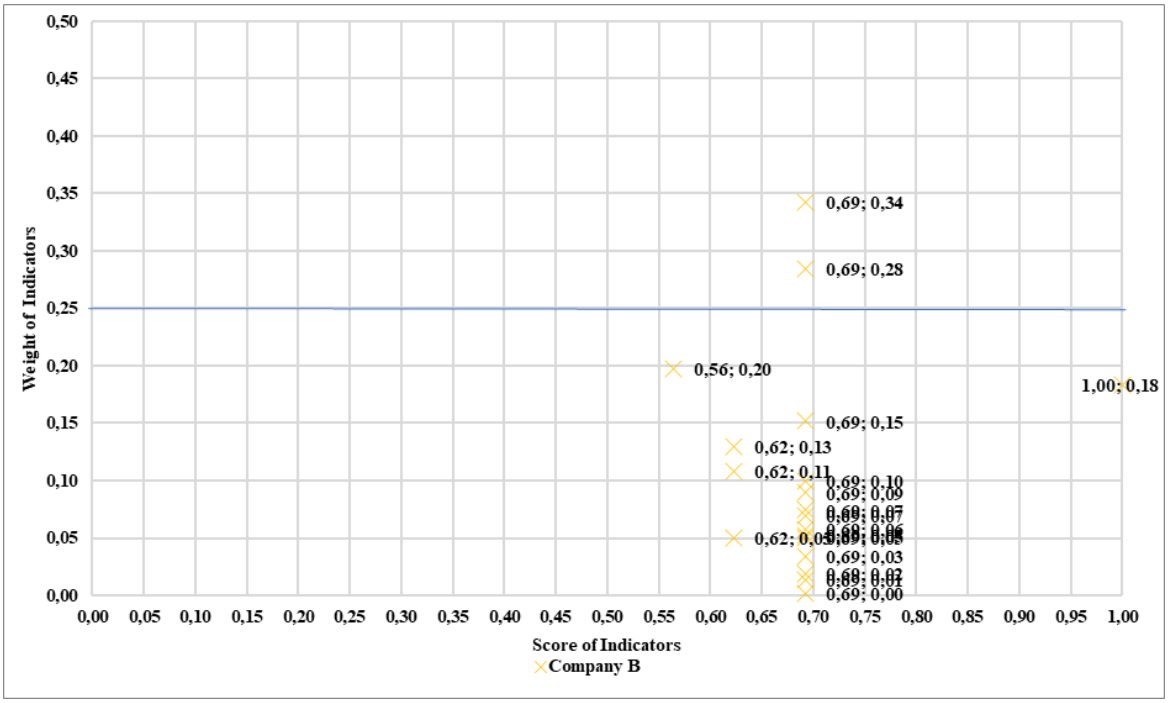

Figure 5. Matrix Recommendation Companies B

In the **social cultural dimension**, Company A and Company B have 2 indicators that need

to be proposed for improvement. The first indicator is Supplier Audit (S2) which has a value of 0.50 for Company A, a value of 0.62 for Company B, and a weight of 0.05. The second indicator is Forced labor practices (S4) which has a value of 1.00 for Company A, a value of 0.69 for Company B, and a weight of 0.65. Thus, the recommendation for both companies is that the company should eliminate forced labor practices for workers, because this has official regulations from the government [37]. Furthermore, both companies should routinely carry out audit activities, especially with suppliers, to control the quality of raw materials [38]. Figure 4 is a diagram of the compilation of recommendations for Company A (see Figure 4). Figure 5 is a diagram of the compilation of recommendations for Company B (see Figure 5).

In the **product integrity dimension**, Company A and Company B have 2 indicators that need to be proposed for improvement. The first indicator is Research and Development (PI2) which has a value of 0.56 for Company A, a value of 1.00 for Company B, and a weight of 0.18. The second indicator is Product Marketing (PI3) which has a value of 0.69 for Company A, a value of 0.69 for Company B, and a weight of 0.66. Thus, the recommendation for both companies is to design a strategy by conducting marketing with a personal approach to potential buyers and participating in exhibition events, as well as increasing marketing through social media such as Instagram [10]. Furthermore, involving student interns to continue conducting research and providing input to the company, and there is an RnD division [39]. Figure 4 is a diagram of the compilation of recommendations for Company A (see Figure 4). Figure 5 is a diagram of the compilation of recommendations for Company B (see Figure 5).

4. Conclusions

Based on the research above, it is known that there are 4 dimensions consisting of 22 indicators (environmental dimensions as many as 7 indicators, economic dimensions as many as 3 indicators, socio-cultural dimensions as many as 9 indicators, product integrity dimensions as many as 3 indicators) that can be used to assess the sustainability of the printing industry. The sustainability value of Company A is 0.74 with a good sustainability category, the sustainability value of Company B is 0.71 with a good sustainability category.

Furthermore, based on the calculation results, several indicators still have low values, so several recommendations are prepared for the printing industry in the city of Surakarta (Company A: PT Margo Mitro Joyo and Company B: PT Putra Nugraha Sentosa). Recommendations include utilizing the potential of environmentally friendly alternative energy in nature to provide added value and minimize environmental pollution, revitalizing nature with a thousand tree planting program, Corporate Social Responsibility (CSR) with the community and government to create urban forests, companies should involve female workers in the company's administration, companies should hold supplier gathering activities or regular meetings with suppliers to establish more loyal cooperation, companies should eliminate forced labor practices for workers, because this has official regulations from the government, audit activities especially with suppliers to control the quality of raw materials, strategic design by conducting marketing with a personal approach to prospective buyers and participating in exhibition events, and increasing marketing through social media such as Instagram, involving interns to always conduct research and provide input to the company, and there is an RnD division.The implications of this study are that research using the MDCM method and measuring tools is very interesting to conduct further research that can be implemented in measuring industrial sustainability in other sectors in Indonesia.

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