THE ANALYTIC NETWORK PROCESS FOR IDENTIFYING THE POTENTIAL SUB-SECTORS OF CREATIVE INDUSTRY: EMPIRICAL FINDING FROM SEMARANG, INDONESIA

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ABSTRACT

Objective: The aims of the present study is to identify the most potential sub-sector of creative industry in Semarang, Indonesia.

Theoretical Framework: The creative industry is considered to promote human development while promoting the economic growth. It maintains and protects cultural and historical heritage, foster individual and communities’ creativities, as well as improve cultural capital. Although there is widespread classification of creative industry, the Indonesian Ministry of Tourism has classified the creative industry into 16 sub-sectors, namely, (1) advertising, (2) application and game developers, (3) architecture, (4) craft, (5) fashion, (6) film, animation, and video, (7) fine arts, (8) gastronomy/culinary, (9) interior design, (10) music, (11) performing arts, (12) photography, (13) product design, (14) publishing, (15) TV and radio (broadcasting), and (16) visual communication design.

Methodology: The analytic network process (ANP) is used to identify the most potential sub-sector of creative industry. A case study is conducted in Semarang, a capital city of Central Java Province, Indonesia. There are four criteria to be considered, i.e., economic, technology, social, and cultural indicator. Data are collected from in-depth interviews with experts in the field of creative industry.

Results and Conclusion: According to the four criteria, it is revealed that the social indicator has the greatest weight among others with value of 0.338. Next, the fashion sub-sector is considered as the most potential sub-sector of creative industry in Semarang with the weight of 0.428. A consistency checking is also performed to test whether the answers of the experts contradict each other or not. The result shows that the value of consistency ratio is 0.049 or less than 0.1, indicating consistency.

Implication of Research: The findings of this study can provide local government with valuable insights to prioritize the most potential sub-sector to be developed to actualized Semarang as a creative city.

Originality/value: Decision-making is of vital importance as it can help management to make good decision.

Keywords: Analytic Network Process, Creative City, Creative Industry, Multi-Criteria Decision Making.

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O PROCESSO DE REDE ANALÍTICA PARA IDENTIFICAR OS POSSÍVEIS SUBSETORES DO SETOR CRIATIVO: RESULTADOS EMPÍRICOS DE SEMARANG, INDONÉSIA

RESUMO

Objetivo: O objetivo do presente estudo é identificar o subsetor mais potencial da indústria criativa em Semarang, Indonésia.

Estrutura teórica: Considera-se que a indústria criativa promove o desenvolvimento humano ao mesmo tempo em que promove o crescimento econômico. Ela mantém e protege o patrimônio cultural e histórico, estimula a criatividade individual e das comunidades, além de melhorar o capital cultural. Embora a classificação do setor criativo seja bastante difundida, o Ministério do Turismo da Indonésia classificou o setor criativo em 16 subsetores, a saber: (1) publicidade, (2) desenvolvedores de aplicativos e jogos, (3) arquitetura, (4) artesanato, (5) moda, (6) filme, animação e vídeo, (7) artes plásticas, (8) gastronomia/culinária, (9) design de interiores, (10) música, (11) artes cênicas, (12) fotografia, (13) design de produto, (14) publicação, (15) TV e rádio (transmissão) e (16) design de comunicação visual.

Metodologia: O processo de rede analítica (ANP) é usado para identificar o subsetor mais potencial do setor criativo. Um estudo de caso é realizado em Semarang, capital da província de Java Central, na Indonésia. Há quatro critérios a serem considerados, ou seja, indicadores econômicos, tecnológicos, sociais e culturais. Os dados são coletados de entrevistas aprofundadas com especialistas no campo do setor criativo.

Resultados e conclusões: De acordo com os quatro critérios, revela-se que o indicador social tem o maior peso entre os demais, com valor de 0,338. Em seguida, o subsetor de moda é considerado o subsetor mais potencial da indústria criativa em Semarang, com peso de 0,428. Uma verificação de consistência também é realizada para testar se as respostas dos especialistas são contraditórias ou não. O resultado mostra que o valor do índice de consistência é 0,049 ou menor que 0,1, indicando consistência.

Implicações da pesquisa: Os resultados deste estudo podem fornecer ao governo local percepções valiosas para priorizar o subsetor com maior potencial a ser desenvolvido para tornar Semarang uma cidade criativa.

Originalidade/valor: A tomada de decisões é de vital importância, pois pode ajudar a administração a tomar boas decisões.

Palavras-chave: Processo de Rede Analítica, Cidade Criativa, Indústria Criativa, Tomada de Decisão Multicritério.

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1 INTRODUCTION

Current changes in competitive and open economy have dramatically changed the way of pursuing a business. Recently, a prosperous business depended greatly on the capacity to create, access, and utilize new information, knowledge, innovations, as well as technologies (Forte et al., 2006; Kourtit and Nijkamp, 2013; Tellier, 2019). These conditions require the firms to be innovative with respect to their products (goods and services) (Deeds et al., 2000). In addition, the development of regional resources might affect strategies of the firms (Lagendijk, 2001; Oughton et al., 2002). It also would assist the firm to create a new
entrepreneurial, employment, market potential, and also to offer novel opportunities that could help the firm to generate better activities. In this way, the firm is able to attain a greater success in a competitive and dynamic environment (Beise and Stahl, 1999).

A prosperous and successful firm typically implement a high level of competence and professionalism to create meaningful benefit for the stakeholders. They are frequently recognized by quickly shifting and varying design specifications to assist progressively personal lifestyles (Scott, 2006). This new type of economy is characterized by the fact that this new economy is able to create a significant contribution to innovation and growth in the society. This condition is met in creative industries (CIs) (Hartley, 2007; Kourtit and Nijkamp, 2012).

The definition of CI refers to industry which has “its origin in individual creativity, skill and talent, and which has a potential for wealth and job creation through the generation and exploitation of intellectual property” (DCMS, 2001). Although CIs are developed widespread, there have been going on several discussions in the scientific literature. This concept develops differently in Asia, Europe, Australia, New Zealand, and North America (Flew, 2012). For example in Indonesia, The Ministry of Tourism has eagerly classified CI into 16 sub-sectors, i.e., (1) advertising, (2) application and game developers, (3) architecture, (4) craft, (5) fashion, (6) film, animation, and video, (7) fine arts, (8) gastronomy/culinary, (9) interior design, (10) music, (11) performing arts, (12) photography, (13) product design, (14) publishing, (15) TV and radio (broadcasting), and (16) visual communication design.

CI is considered could stimulate human development while promoting the economic growth. Specifically, CI maintains and protects historical heritage, improves cultural capital, and promotes communities and individual creativity. It leads to the improvement of cities’ cultural assets, establishment of identity and city brands, creative economy promotion, and overall economic and social development (Wuwei, 2011). The world trade of creative products continues its expansion in 2008, reaching USD 592 billion with 14% of annual growth rate during 2002 to 2008, regardless 12% decline in global trade because of the financial crisis (UNCTAD, 2013). In Indonesia, the contribution of CI continues to increase. In 2010, the GDP of CI reached IDR 185 trillion; this number continues to increase with 5% average growth 2010 to 2013 (it reached IDR 215 trillion in 2013). In 2010 to 2013, CI could generate employment for about 10.6% of the national labor; this was driven by the growth of businesses in CI in that period by 1%. In number, the amount of CI in 2013 was 5.4 million and could engage 12 million employments (Kementerian Pariwisata and Badan Ekonomi Kreatif, 2014).

CI is also considered as main contributor in promoting and developing creative economy (CE). In Indonesia, CE does not only contribute to the economy, but also plays an essential role
in strengthening the image and identity of the nation, developing renewable resources, encouraging innovation, and bringing a positive social impact, including improving the quality of life, creating an equity in social welfare, and increasing tolerance in society. The GDP of CE enlarged from IDR 525.96 trillion to IDR 852.24 trillion or increased about 10.14% per year in the period of 2015–2016. It contributed for approximately 7.38% to 7.66% of the national economy with the growth of about 4.38% to 6.33%; and it is projected to be increased more for the next years (Badan Pusat Statistik and Badan Ekonomi Kreatif, 2016).

The government of Indonesia through the Ministry of Tourism and Creative Economy has launched the long-term master plan on creative economy for 2005-2025 as Creative Economy as a New Power of Indonesia in 2025. A successful implementation of this master plan relies heavily on a synergy and cooperation of all stakeholders, i.e., the quadruple helix: communities, businesses, intellectuals, and the governments (provinces, cities, and counties); thus, the development of CI depends on the program brought by the government of the city where the CI take place.

The creative cities network (CCN) program which has been launched by UNESCO in 2004 has a mission to establish international cooperation among cities were creativity is put as a strategic factor for sustainable development by involving all relevant stakeholders. CCN is designed to facilitate the exchange of knowledge, experience, and resources of the CCN members to lift the regional or local CIs and to promote cooperation in sustainable development. UNESCO has listed 116 cities around the world as creative cities, based on seven sub-sectors: design, crafts and folk art, gastronomy, film, media arts, literature, and music. Only two cities in Indonesia that have been appointed; there are Pekalongan as a craft and folk-art city and Bandung as a design city.

Semarang, as a capital city of Central Java Province, as stated by the Minister of Tourism could be the next creative city in Indonesia. Identifying the potential sub-sectors of CI could be one-step ahead to actualize Semarang as a creative city. It is considered important since CI has significant contributions not only to the national economy but also for Semarang economy. CI as a center of innovation creation is able to generate good business climate as well as reinforce city’s image and identity. The most potential sub-sector could be a distinctive feature of Semarang that can distinguish from other cities to be listed in UNESCO as a creative city, Semarang has to differentiate itself and classifies as one of the seven sub-sectors classified by CCN program. In addition, this may potentially be used to construct prioritized policies related to realizing the creative city for not only policymakers, i.e., the local government, but also industry professionals. The policies generated thenceforward, could be more focused, more
efficient, and more effective in accordance with particular potential that exists in the city. Therefore, the objective of this research is to identify the most potential sub-sector of CI in Semarang.

This article is organized as follows. Research design of this study is introduced in the next section as well as the criteria and their sub-criteria for identifying the potential sub-sectors of CI. Next, the analytic network process (ANP) is presented to give the readers such understanding about the tool that was used to achieve the objective of the study. An empirical finding: result and discussion, i.e., the most potential sub-sectors of CI in Semarang and its current condition, is described in Section 4. Finally, the last section is devoted for conclusion.

2 THEORETICAL FRAMEWORK

Researching CI necessitates a clear understanding of this sector. Various methodologies have emerged in the literature to define the concept. These methodologies can generally be categorized into four approaches: the “creative industries” approach, the “copyright industries” approach, the “experience economy” approach, and sector-specific studies (European Commission, 2006). This study adopts the “creative industries” approach, which aligns with a conceptual definition of this sector proposed by the Creative Industries Task Force of Department for Culture, Media and Sport (DCMS) of the United Kingdom. According to this approach, CIs are defined as “industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property” (DCMS, 2001).

CIs may include both activities which have a commercial focus as well as non-profit activities performed by private or public organisations, often including cultural activities such as museums or libraries. Caves (2000) stressed that discussion of the economic properties of CIs, and those who work in them, should be distinguished from debates about the pros and cons of public subsidy for the arts. The importance of this point arises from the fact that both ‘subsidised’ and ‘unsubsidised’ CIs’ activities share common elements, including:

- Significant uncertainty surrounds the demand for creative products because they are considered “experience goods”. Buyers lack information about them prior to consumption, and their satisfaction is highly subjective and intangible.
• Creative producers often find non-economic fulfilment in their work and creative endeavours. However, they must also engage in mundane tasks such as basic accounting and product marketing to ensure economic viability.

• Creative production is frequently a collaborative effort, necessitating the development and maintenance of diverse teams with varied skills, interests, and expectations about the final product.

• There exists an immense diversity of creative products available, both within specific formats (e.g., videos in a rental store) and across different formats.

• CIs exhibit vertically differentiated skills, characterized by what Caves terms the “A list”/”B list” phenomenon. Producers or content aggregators assess and rank creative personnel accordingly.

• Coordinating diverse creative activities within a relatively short and often limited timeframe is essential.

• Many cultural products have long-lasting durability, allowing their producers to continue extracting economic benefits (e.g., copyright payments) long after their initial production period.

Connecting activities in CIs to industrial classification systems utilized by official statistics enables the identification of enterprises falling within the CIs and clarifies the extent of these enterprises’ economic operations. This method is commonly employed in scholarly works (refer to Higgs et al., 2008, for the UK, or OECD, 2006). In Indonesia, The Ministry of Tourism has classified CI into 16 sub-sectors, i.e., (1) advertising, (2) application and game developers, (3) architecture, (4) craft, (5) fashion, (6) film, animation, and video, (7) fine arts, (8) gastronomy/culinary, (9) interior design, (10) music, (11) performing arts, (12) photography, (13) product design, (14) publishing, (15) TV and radio (broadcasting), and (16) visual communication design.

3 METHODOLOGY

3.1 CRITERIA AND SUB-CRITERIA DEVELOPMENT

To identify the potential sub-sectors of CI, this study performed literature review, such as from (Benito et al., 2013; Florida, 2012; Martinaitytė and Kregždaitė, 2015; Tubadji et al., 2015) as well as in-depth interview with some experts in the field of CI; they are lecturers from
university, practitioners, and civil servants from Development Planning Agency of Semarang and Industry and Trade Agency of Central Java Province. This rich discussion ensures that the quadruple helix collaboration approach was employed in this study. In sum, four criteria comprise of fifteen sub-criteria were determined.

The first criterion is economic indicator. CIs are able to generate jobs, to enlarge economic activity, and to facilitate economic evolution by contributing to the evolution of social, individual behavior, and institution (Potts, 2011). The growth of the economic differs several aspects, such as human capital, a capability to draw a creative class, as well as to execute those benefits in the form of new ideas and local or regional growth. These corroborate the fact that CIs are regarded as an essential sector for economic growth and development. It then generates the first sub-criterion, i.e., the employment (E1). CI is related to the settings of local economic system; thus, government expenditures to CI sector (E2) and its contribution to regional development (E3) could be included as the second and third sub-criteria in this economic indicator. The next sub-criteria would be infra-structure readiness (E4), marketing capability (E5), and export of CI (E6).

The second criterion is technology. It is believed as a factor for the changes and growth of the economic. The knowledge of technological development importance is essential. Technological capacities of a country might be assessed by the number of patents (T1), government expenditure for research and development (T2), and employment in research and development sector (T3).

The third criterion is social indicator. There are four sub-criteria for this criterion, i.e., inhabitants with high education (S1), creativity index (S2), tolerance index (S3), and policy and institutional support (S4). The second sub-criterion is the standard indicator for CE to be executed. This indicator is used for the assessment of local or region’s long-run economic creativity trends (D’Andrea, 2013). Tolerance is included here since it is considered as the most vital to local or region’s ability to grab creative talents’ attention as well as to mobilize them (Florida, 2012). The tolerance index refers to the possibility to open the door and let new cultures, new people, and minorities to get it. Cities which are open to this new concept, and which could draw talented and creative people attention will have the ability to widen their capabilities related to technology and talent; so that they will easier gain an economic benefit.

The last criterion is cultural indicator. The term CI encompasses cultural industries and artistic (or cultural) production. This cultural industry is those in which its products cover an important element of creative or artistic effort, for instance, advertising and architecture (UNESCO, 2006). As shared values, culture could influence the determination of social and
economic objectives. Ultimately, it also will affect macro-economic outcomes, for instance, gross domestic product, structural changes, employment, income and social welfare programs, as well as technological performance (Throsby, 2001). This criterion consists of two sub-criteria, i.e., students enrolled in arts and humanities studies (C1) and expenditures for culture and recreation (C2).

3.2 THE ANALYTIC NETWORK PROCESS

In order to apply the ANP approach, the criteria and their sub-criteria are initially structured into a network model. It is depicted in Figure 1. There are some elements in the network, such as clusters, nodes (elements in the clusters), and arrows/arcs (indicate dependencies). In Figure 1, we have a network of clusters and some possible dependencies between them. It is possible for a cluster to depend on another cluster (outer dependencies), but at the same time, it can influence itself (inner dependencies). The criteria and sub-criteria will be compared in the ANP. We collect data from seven experts in the field of CI (similar experts that involved in in-depth interview section). A nine-scale questioner was utilized to display the respondents’ judgment; they are extremely - , very strongly - , strongly - , moderately favorable (or unfavorable), and equal (or neutral); see Table 1.

Figure 1
Initial network mode

Table 1

A nine-scale questionnaire

<table>
<thead>
<tr>
<th>Intensity of importance</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance</td>
<td>Two activities contribute equally to the goal</td>
</tr>
<tr>
<td>3</td>
<td>Moderate importance</td>
<td>Experience and judgement slightly favor one over another</td>
</tr>
<tr>
<td>5</td>
<td>Strong importance</td>
<td>Experience and judgment strongly favor one over another</td>
</tr>
<tr>
<td>7</td>
<td>Very strong importance</td>
<td>Activity is strongly favored, and its dominance is demonstrated in practice</td>
</tr>
<tr>
<td>9, 2, 4, 6, 8</td>
<td>Intermediate values</td>
<td>Used to represent compromise between the priorities listed above</td>
</tr>
</tbody>
</table>

Source: Saaty (1980)

It is believed that the analytic hierarchy process (AHP) (Saaty, 1980) is one of the most popular methods in multi-criteria decision making (MCDM) problems. It can handle multiple criteria which are often conflicting (Ulkhaq, et al., 2016a). The AHP has widely been applied to solve numerous socio-economic decision-making problems, see for example (De Lima et al., 2024; Nour and Manuela, 2023; Pramono et al., 2017; Sari et al., 2018; Ulkhaq et al., 2016b, 2018a, 2018b; Wijayanti et al., 2018). However, the AHP cannot be used if it is suspected that there are interdependent relationships among criteria and/or sub-criteria since it is assumed that those are independent each other. The ANP (Saaty, 1996), on the other hand, is suggested to handle this interdependence issue. It has been applied also in many MCDM problems, see for example (Chemweno et al., 2015; Hsu et al., 2012; Wan et al., 2017).

The ANP could be composed into four major steps (Chung et al., 2005; Liang et al., 2013; Yüksel and Dagdeviren, 2007):

- Structuring the problem and constructing the model.

First of all, the problem must be declared very clearly. Later, it should be structured into a network. The network model could be obtained through discussion, brainstorming, or any other appropriate method. The network model of this study has been depicted in Figure 1. The goal of this study, which is identifying the potential sub-sectors of CI in Semarang, is located in the left of the network; while the alternatives, i.e., the potential sub-sectors of CI that have to be chosen are located in the right-hand side; and the criteria as well as their sub-criteria are positioned between the goal and the alternatives. The outer dependencies: (i) between goal and the criteria are shown by solid arrows, (ii) between alternatives and the criteria are indicated by dot arrows, and (iii) among other criteria are shown by dashed arrows. The inner dependencies among sub-criteria in their own criterion are represented by dashed loop arcs.

- Constructing pairwise comparison matrices and local priority vectors.
The experts who are also the decision makers are requested to answer several pairwise comparisons questionnaires to express their preferences of: (i) criterion to criterion, (ii) sub-criterion to other sub-criterion with respect to the specific upper-level criterion, (iii) alternative to alternative in terms of contribution to the sub-criteria. Also, inner dependencies among sub-criteria of a criterion have to be evaluated in pairwise. In this study, the relative importance value is based on Saaty’s 1 to 9 scale, see Table 1. Let \( n \) be the number of criteria or sub-criteria to be evaluated; then an \( n(n-1)/2 \) pairwise comparisons will be examined. A represent an \( n \times n \) pairwise comparison matrix as:

\[
A = \begin{bmatrix}
1 & a_{12} & \cdots & a_{1n} \\
 a_{21} & 1 & \cdots & a_{2n} \\
 \vdots & \vdots & \ddots & \vdots \\
 a_{n1} & a_{n2} & \cdots & 1
\end{bmatrix}
\]

The diagonal elements contain scalar one because they are self-compared. The other elements represent the relative importance of \( i \)th element compared to \( j \)th element. Next, a local priority vector is obtained as an estimate of the relative importance related to the criteria (or sub-criteria) as follows:

\[
A \times w = \lambda_{\text{max}} \times w,
\]

(1)

Where:

\( w \) is the eigenvector and \( \lambda_{\text{max}} \) is the largest eigenvalue of matrix \( A \).

- Constructing the super-matrix.

The super-matrix \( S \) is actually a form of partitioned matrix. Let \( K_m, m = 1, 2, \ldots, N \), be the cluster, with each cluster \( m \) has \( n_m \) elements, represented by \( e_{m1}, e_{m2}, e_{mn} \). Then, each matrix segment in the super-matrix denotes a relationship between two clusters. The local priority vectors that have been found in the previous step are then collected and placed in the right of super-matrix as:
Because there could be interdependence in the clusters, the sum of S’s columns might have the value of more than one. Therefore, S has to be adjusted so that each column has value of one, see Saaty (1996) for the detailed adjustment. The resulting matrix is called the weighted super-matrix W.

- Constructing the limit super-matrix.

The next step is to raise W to exponential powers so that we can get the limit super-matrix L. It involves: \( \lim W^p \). Another way to obtain this convergence is to raise W to the power of \( 2q+1 \), where \( q \) is an arbitrarily large number. The final priorities are found by normalizing each cluster of L. This will be called normalized super-matrix N.

- Selecting the best alternatives.

The priority weight of each alternative could be discovered in N’s column of alternatives. The best alternative is the one with the largest overall priority.

4 RESULTS AND DISCUSSION

4.1 FINDINGS

The goal of this work is to find the most potential sub-sectors of CI in Semarang, Indonesia. Four criteria—economic indicator, technology indicator, social indicator, and cultural indicator—comprises of fifteen sub-criteria were used to achieve the objective. Experts who have different background, i.e., academic, business, and government, were involved in this study. They gathered and collaborated in this study from discussing the appropriate criteria and sub-criteria by answering and fulfilling the questionnaire to determine the most potential sub-sectors of CI in Semarang.

The first finding of this study revealed that from those four criteria, only economic indicator and cultural indicator which have inner dependencies, see Figure 2. In Figure 2, the shaded areas indicate that there are dependencies between two sub-criteria; for example, there is outer dependency between sub-criteria E1 and B1. However, as there is no shaded area in
between technology indicator and cultural indicator, it was concluded that those two criteria have no inner dependencies. Therefore, the initial network model as depicted in Figure 1 has to be changed as in Figure 3. Note that there are no loop arcs above (or below) the technology indicator and cultural indicator criteria.

**Figure 2**
*Interdependencies among sub-criteria*

![Figure 2: Interdependencies among sub-criteria](image)

**Figure 3**
*Final network model*

![Figure 3: Final network model](image)
After determining the dependencies status among the criteria and sub-criteria, respondents then were asked to fill the questionnaire (pairwise comparison) to state their preferences among the alternatives, criteria, and sub-criteria. The responses from the decision makers were combined to get a pooled value by employing the geometric mean calculation. Results of the geometric mean from three pairwise comparisons, i.e., for criteria, sub-criteria, and alternatives, are shown in the Appendix.

Values from Table A1 to Table A6 are then applied to construct the super-matrix S. The results, which are the overall priority matrix and the alternative priority weights are displayed in Table 2 and Table 3.

**Table 2.**

**Overall priorities of the criteria and sub-criteria**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Priority of the criterion</th>
<th>Sub-criterion</th>
<th>Priority of the sub-criterion</th>
<th>Overall priority of the sub-criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic indicator</td>
<td>0.326</td>
<td>E1</td>
<td>0.250</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E2</td>
<td>0.101</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
<td>0.166</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E4</td>
<td>0.202</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E5</td>
<td>0.192</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E6</td>
<td>0.089</td>
<td>0.056</td>
</tr>
<tr>
<td>Technology Indicator</td>
<td>0.223</td>
<td>T1</td>
<td>0.412</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T2</td>
<td>0.235</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T3</td>
<td>0.353</td>
<td>0.077</td>
</tr>
<tr>
<td>Social indicator</td>
<td>0.338</td>
<td>S1</td>
<td>0.185</td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2</td>
<td>0.351</td>
<td>0.164</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3</td>
<td>0.074</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S4</td>
<td>0.390</td>
<td>0.091</td>
</tr>
<tr>
<td>Cultural indicator</td>
<td>0.113</td>
<td>C1</td>
<td>0.461</td>
<td>0.067</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2</td>
<td>0.539</td>
<td>0.030</td>
</tr>
</tbody>
</table>

**Table 3**

**Alternative priority weights**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Weight</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>0.34642</td>
<td>2</td>
</tr>
<tr>
<td>Fashion</td>
<td>0.42826</td>
<td>1</td>
</tr>
<tr>
<td>Application and game developers</td>
<td>0.22532</td>
<td>3</td>
</tr>
</tbody>
</table>

As can be seen in Table 2 in the second column, the social indicator criterion has the greatest weight among other criteria with value of 0.338. The second greatest weight is economic indicator criterion with 0.326, only slightly different with the first rank. This finding told us that in determining the most potential sub-sectors of CI in Semarang, the decision makers believed that those two criteria were considered important. Technology indicator
criterion was positioned in the third rank with 0.223, while the cultural indicator criterion has the lowest weight among all with 0.113. It seems that the decision makers considered this criterion was not too important in determining the most potential sub-sectors of CI.

The fourth and fifth columns of Table 2 shows two types of weights, i.e., local priority of the sub-criterion and global priority of the sub-criterion. The global weight indicates the weight of the sub-criterion compared to other sub-criteria in the overall network model, while the local weight is the normalization result of the global weight which shows only the weight of the sub-criterion in its cluster/criterion. It can be concluded that all global weights will sum to unity while all local weights in a particular criterion will sum to unity.

Top five of the most important sub-criteria were coming from social and technology indicator criteria. The biggest weight among all is creativity index (S2) with 0.164, the second is number of patent (T1) with 0.154, the third, fourth, and fifth are policy and institutional support (S4) with 0.091, employment in research and development sector (T3) with 0.077, and government expenditure for research and development (T2) with 0.077. It is interesting to see that three of the top five sub-criteria were coming from technology indicator criterion. It is such a contradiction since the technology indicator criterion has smaller weight than economic and social indicator criteria. When the decision makers assessed the criteria, they tried to compare the importance of each criterion relative to others; however, when they assessed at the sub-criteria level, they compared the importance of the particular sub-criterion with all sub-criteria in their upper-level criterion. For example, the decision makers may consider number of patent (T1) is the most important sub-criterion in the technology indicator criterion (the weight is 0.412); and when it is compared with other sub-criteria in the network model, it ranks two among others. However, when the decision makers did in the criteria level, they might not consider that the technology indicator criterion is the most important criterion among others.

Moving to Table 3, it can be seen the weights for each alternative: for architecture is 0.34642, fashion is 0.42826, and application and game developers is 0.22532. According to this result, the leading sub-sectors of CI in Semarang based on four criteria: economic, technology, social, and culture indicator is fashion sub-sector. CI on fashion sub-sector can be defined as the activities related to design of clothes or fashion accessory, production of clothes and also their accessories, as well as fashion products distribution. Some difficulties indeed are raised when one wants to make a clear separation between textile production and garments industry that belongs to the mainstream manufacturing industries and fashion industry that belongs to CI.
Fashion sub-sector, which has been selected as the most potential sub-sector of CI in Semarang, is predicted to grow 16% of the sector’s growth; positioned as number two after culinary sector with 41.6% (Global Business Guide Indonesia, 2018). In addition, in terms of contribution to GDP, fashion is one of CI’s dominant sub-sectors in Indonesia, i.e., 63.3% (Global Business Guide Indonesia, 2011). Prioritizing this sub-sector could support national government program since Indonesia aims to be World’s Islamic fashion capital in the next couple years. The program is endorsed by the popularity of hijab and Muslim fashion in Indonesia that has raised for the last decades (Global Business Guide Indonesia, 2016).

4.2 CONSISTENCY CHECKING

In order to finalize this study, a consistency checking was performed to test whether the decision makers’ responses contradict each other or not. Saaty (1996) used consistency index ($I$) as well as consistency ratio (CR) to validate comparison matrix’s consistency:

$$I = (\lambda_{max} - d)/(d - 1),$$

(2)

$$CR = I/RI,$$

(3)

Where:

$d$ is the number of decision makers and $RI$ or random index is the average consistency index simulated over abundant random entries of the same order reciprocal matrices. When CR is less than or equal to 0.1, it indicates consistency; otherwise, new comparison matrices have to be generated by asking the decision makers to make a remedy of their answers. (This iteration will stop until the value of CR is less than or equal to 0.1) The value of CR in this study is 0.04857 or less than 0.1, indicating consistency.

5 CONCLUSION

This research aims to identify the most potential sub-sectors of CI in Semarang, Indonesia. Experts from academic, business, and government were involved in this study to discuss the appropriate criteria and sub-criteria to be included in identifying the most potential sub-sectors of CI as well as to give their idea related to the relative importance among those proposed criteria and sub-criteria. Results of this work which are shown in Table 2 and Table

3 show that social and economic indicators have the first and second highest weights among other criteria. The ranking of the sub-sectors based on the calculations is: fashion with 42.826%, architecture with 34.642%, and application and game developers with 22.532%. The findings can provide local government with valuable insights to prioritize the most potential sub-sector to be developed to actualized Semarang as a creative city. Formulating strategies to implement the result of this study would be the next work to do.

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REFERENCES


