

Sustainability Analysis Of Gringsing Weaving Industry: Probability Approach

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ABSTRACT

The Gringsing weaving craft industry is a culture-based creative industry that has values and characteristics as a local cultural heritage. Various threats, both external and internal, threaten the sustainability of the Gringsing woven fabric industry. The objectives to be achieved in this research are first, to determine the probability scenario of Gringsing weaving sustainability. Second, to determine the sensitivity of scenarios driving the sustainability of Gringsing weaving in Tenganan Pegringsingan Village, Karangasem Regency, Bali Province. The study uses primary data obtained through surveys and focus group discussions (FGD). Sustainability analysis using SMIC-Prob probability analysis. The results of the analysis show that of the four scenarios formulated by the results of the FGD with the experts, there is a combination of scenarios with the highest conditional opportunity, namely the scenario of craftsmen producing as usual, apart from producing, they also open kiosks and reducing production is the best combination with a probability of 0.124. Meanwhile, scenario sensitivity is shown with the highest elasticity results in the increase scenario (increasing production) of 1.422 which is heavily influenced by the scenario of continuing to produce as usual of -0.624. This means that every 100% increase in the production scenario as usual will reduce the chance of craftsmen increasing production by 62.4 percent.

Keywords: gringsing weaving, sustainability, probability

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INTRODUCTION

The creative industry is an industry that originates from the utilization of creativity so that it originates from ideas or ideas (Laksmi & Arjawa, 2023) . The development of creative industries is currently a program promoted by the government. The creative industry makes a major contribution to improving the economy and development (Kusumastuti, 2016; UNESCO, 2009). The creative economy becomes a concept that is between creativity and the economy.

The creative economy can be seen from the cultural aspect, namely the combination of economic activity and culture (Cho, Liu, & Ho, 2018; Buitrago & Duque, 2013). These activities include the creation, production, and commercialization of intangible and cultural creative content. Culture-based creative industries or also known as cultural industries have strong local values that enable diversification of economic activities in a region in a sustainable manner (Cooke & de Propris, 2011). On the other hand, creative

activities that utilize local cultural resources are expected to be able to preserve culture sustainably (Anugerah & Prasetya, 2015).

The cultural industry is considered important in linking traditional knowledge with innovation and creativity because it has economic potential and has an impact on economic development (Pessoa et al., 2009; J. Yang & Černevičiūtė, 2017). The cultural industry plays an important role in people's income and job creation and has been recognized worldwide as a tool for overcoming poverty (Balaji & Mani, 2014; Y. Yang et al., 2018).

One of the culture-based creative industries is the textile industry, especially woven fabric crafts. Local wisdom (local genius) from woven fabrics has the cultural identity of a region or country so that it is able to absorb and cultivate foreign culture according to its own characteristics and abilities. Local wisdom in the woven fabric industry is closely related to community creativity which leads to economic independence.

Bali, as one of the tourism destinations in Indonesia, also has a textile craft industry which is the identity of local Balinese cultural wisdom. According to Fahmi (2016) dan O'Connor (2007), the cultural industry presents symbolic, authentic, historical, and aesthetic

meanings derived from cultural values to cultural products and specific visual attributes (Fahmi, 2016; O'Connor, 2007). The diversity of textiles in Bali is influenced by the independence, creativity, innovation, and rich traditions of the Balinese people, which have experienced a long and continuous evolution (Hauser-Schäublin, B.; Marie-Louise, N.-K.; Ramseyer, 1997). The industry is the Grinsing woven fabric industry.

Grinsing woven cloth is the result of a woven craft that has beauty, a social ritual concept, and philosophy (Lodra, 2015). The superiority of the manufacturing technique is a legacy from our ancestors that has become entrenched in the people of the Tenganan Pegringsingan Traditional Village, Karangasem Regency, Bali Province. For the Balinese people, especially the people of the Tenganan Pegringsingan Traditional Village, the Grinsing woven fabric has a spiritual, social religious meaning in a sacred space.

Grinsing woven fabrics have specific techniques, colors, and motifs that are traditionally made from the processing of materials to become fabrics. It is made using manual labor (handmade). Basically, this cloth is used in customs, religion, and ritual activities, although its development does not rule out the possibility of commercial use. As has been done by the Ministry of Tourism and

Creative Economy, making Grinsing woven fabrics a souvenir for delegations at the G20 summit in Bali (Nampu, 2022). This activity had a big impact on the Grinsing woven fabric craftsmen.

e-examining traditional woven fabrics will be very important for sustainable life and society now and in the future because they contain aspects of old and new, past and future, as well as tradition and innovation (Fukatsu, 2014). In the process of developing traditional woven fabrics, there are challenges both external and internal. External challenges originate from the physical environment (environment) which influences the process of growth and survival of this industry and internal challenges originate from human resources which are based on the social relationship system that applies in society.

The production of traditional woven fabrics by local people often tends to be too traditional and old-fashioned. This has an impact on the limited production process which in the end is unable to meet market needs. Grinsing weaving craftsmen also face similar problems regarding raw materials, especially threads, which are difficult and the dyeing process takes a long time. These conditions lead to poor production activities that threaten the industry.

Industrial sustainability can be seen from various aspects, first, from the economic side, namely how woven fabrics can continue to be produced with limited production processes. Second, from the environmental side, namely the production process requires to use of renewable energy and the final product fulfills its function efficiently and has a fair social impact (Rusu, 2011).

In line with the progress of tourism, modernization, and globalization, Grinsing weaving grows derivative commodities of a secular nature. This is a sign of commodification of meaning according to environmental conditions. While the use of Grinsing weaving for secular purposes is still ongoing, signs of commercialization are also evident. The process of commodification, namely changing the value and function of an item or service into a commodity that has economic value, also occurs by collaborating on the interests of the tourism industry, cultivating a fashion culture with considerations of nature, customs, social, culture and the economy of the community. Commodification does not rule out the possibility of shifting sacred values to secular ones. All of this will have an impact on the economy, cultural preservation, materialistic, welfare, symbolic, which will bring about change. Related to this phenomenon, Grining

woven faces the threat of manufacturing competitors' products as imitation goods which have an impact on the market price of the product.

Adaptasi ekonomi terhadap keterbukaan masyarakat menunjukkan bahwa nilai-nilai budaya lokal mempunyai keterkaitan dengan kemampuan daya saing industri lokal untuk mampu bertahan di era globalisasi (Inanna, 2014). Therefore, it is very important to study the sustainability of the Grinsing weaving industry. Threats to Grinsing weaving require studies related to its sustainability. The aim of this research is first, to determine possible scenarios of Grinsing weaving desires. Second, determine the sensitivity of the Grinsing weaving expulsion scenario in Tenganan Pegringsingan Village, Karangasem Regency, Bali.

Studies related to the sustainability of local industries that are traditional and contain cultural values are more closely linked to environmental conditions (Rusu, 2011). In this context, industrial desires are linked to the need to maintain and develop traditional industries without damaging the surrounding environment. The transfer of cultural values was also researched by Nuringsih, et.al. (2020) namely how to ensure that local cultural wisdom is maintained in batik cloth patterns in Yogyakarta. These studies are more on the

correlation and determinants of industry desires.

One strategy for the sustainability of culture-based creative industries is the involvement of the community to preserve and develop local characteristics so that they are not eroded by foreign cultural invasions. Preservation of Grinsing weaving through the integration of cultural knowledge with rules and verification of design applications, the natural coloring process on Grinsing fabrics is relevant to environmental and cultural aspects (Widiawati et al., 2012). In contrast to previous studies, in this study, the desires of culture-based creative industries, especially Grinsing woven fabrics, were carried out using the SMIC-Prob desire analysis approach. With this approach, scenarios are identified that can be carried out to maintain the desire for Grinsing woven fabrics as a form of study contribution.

RESEARCH METHOD

The research location is Tenganan Pegringsingan Village, Karangasem Regency, Bali Province. The analysis uses primary data taken using survey and focus group discussion (FGD) methods. The survey respondents were Grinsing woven fabric craftsmen who are still actively producing in the Tenganan Pegringsingan Traditional Village as many as 120 people and the FGD sources were stakeholders including experts/experts in

Grinsing woven cloth, government agencies, especially the Karangasem Regency Industry Office, Bali Provincial Industry Office, and village community leaders Tenganan Pegringsingan about 19 participants.

A strategic design model was carried out for the sustainability of Grinsing weaving by including aspects of uncertainty, namely the SMIC-Prob-Expert analysis (Godet et al., 2004). his method is based on probability theory, to assess the likelihood of an activity occurring and SMIC-Prob calculates a combination of possible scenario scores to be implemented or not implemented (Fauzi, 2019). The resulting combination is based on the number of scenarios or events observed with a combination of $r = 2^n$, where n is the number of scenarios observed. Determining various event scenarios is based on the opinions of experts in Grinsing weaving which are carried out through FGDs and filling out questionnaires, which can be written: $H=(e_1, e_2, \dots, e_n)$, and $e_1 - e_n$ indicates an event or activity. The FGD also determines the simple probability ($P(i)$, the conditional probability of each scenario in the form:

$$P = \binom{i}{j} = \text{probability of scenario } i \text{ if scenario } j \text{ occurs}$$

$$P = \binom{i}{\bar{j}}$$

= the probability of scenario i if scenario j does not occur

SMIC-prob also requires the requirements of each opportunity in order to operate, viz.:

$$0 \leq P(i) \leq 1$$

$$P(i/j)P(j) = P(j/i)P(i) = P(ij)$$

$$P(i/\bar{j})P(j) + P(i/\bar{j})P(\bar{j}) = P(i)$$

By using the quadratic programming method to determine the probability combination score through the objective function:

$$\text{in } \sum_{ij}^n \left[P \binom{i}{j} P(i) - \sum_{k=1}^r t(ijk) \pi_k \right]^2 + \sum_{ij}^n \left[p \binom{i}{\bar{j}} p(j) - \sum_{k=1}^r s(ijk) \pi_k \right]^2$$

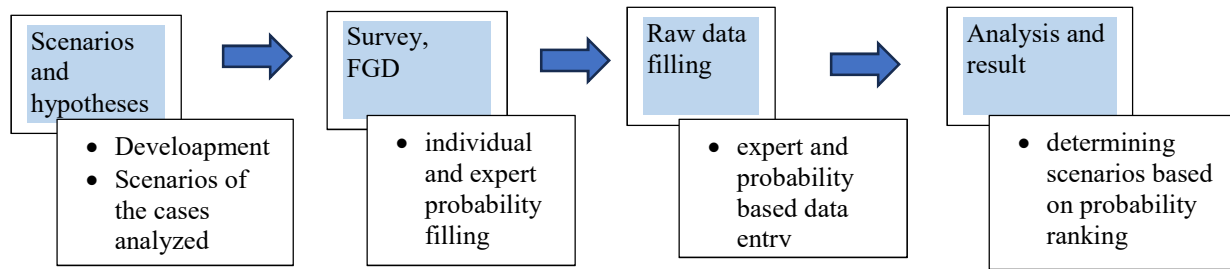
constraints:

$$\sum_{k=1}^r \pi_k = 1, \text{ and } \pi_k \geq 0 \text{ for all } k$$

The symbol π_k describes the probability scenario k whose value is sought from the minimization solution above. The value of $t(ijk)$ will be equal to 1 when the i and j events occur in scenario k , and 0 when events i and j do not occur in scenario k . The value of $s(ijk)$ will be equal to 1 if the value of event i occurs in scenario k but event j does not occur. Conversely, the value of $s(ijk)$ will be 0 if event i does not occur, but event j occurs in scenario k . The solution from quadratic programming produces an opportunity score from the highest to the lowest which is presented in tabular form, as well as the elasticity value of the probability for each event in the form:

$$e_{ij} = \frac{P(i)\Delta P(j)}{P(j)\Delta P(i)}$$

Based on the FGD, the experts weaving, data analysis, and interpretation of determined the hypothesized probabilities. the results. Figure 1 below is the determination



Uncertainty analysis with SMIC-Prob has several stages to produce a combination of scenarios. In general, this stage is related to collecting information related to the sustainability of the observed Grinsing

of opportunities by experts which is a decisive step to produce the outcome of the analysis. The second and third stages are the main components of the SMOC-Prob analysis stage.

Figure 1: SIMC-Prob Analysis Stages
Source: Fauzi,2019

RESULT AND DISCUSSION

According to the SMIC-Prob analysis stages, the initial stage is to identify the probability scenarios that will be analyzed. The scenarios in this research are the possible actions of Grinsing weaving craftsmen in production. Based on the results of the questionnaire which were adapted to the FGD results, there were four scenarios (in the SMIC-Prob data input they are called hypotheses), which were identified for the sustainability of the Grinsing weaving industry, namely: first, continuing to produce as usual (usual); second, in addition to production, other businesses such as opening a kiosk, fashion (side commercial); third, increase production (increase), and fourth, reduce production (decrease).

SMIC-Prob Analysis Results

Determining Sustainable Probability Scenarios for Gringsing Weaving

Calibration from raw data to net data is the initial process of SMIC-Prob analysis so that the data becomes more accurate so simple probability and conditional probability data from raw data are recalculated to become net

	Probabilities
1 : usual	0,4
2 : komersial	0,6
3 : increase	0,35
4 : decrease	0,65

data. The calibration results from raw data to net simple opportunity data for the action

scenarios of Grinsing weaving craftsmen are in accordance with Figure 2.

	Probabilities
1 : usual	0,516
2 : commercial	0,496
3 : increase	0,431
4 : decrease	0,591

Figure 2 : raw data and net data simple probabilities (P_i)

The change from raw data to net data on simple opportunities shows that there are changes such as craftsmen continuing to produce as usual from 0.4 (40%) changing to 0.516 (51.60%) after calibration. And there is a scenario that shows a decrease in opportunities, namely that craftsmen besides producing also open other businesses, down

from 0.6 (60%) to 0.496 (49.6%), and the actions of craftsmen which reduce production are from 0.65 (65%) to 0.591 (59.1%).

Figure 3 presents the results of calculating data on net conditional opportunities, both those that will be realized and those that will not be realized.

	usual	komersial	increase	decrease
1 : usual	0,516	0,537	0,364	0,48
2 : komersial	0,515	0,496	0,444	0,585
3 : increase	0,304	0,386	0,431	0,421
4 : decrease	0,55	0,698	0,578	0,591

a. (P_{i/j})

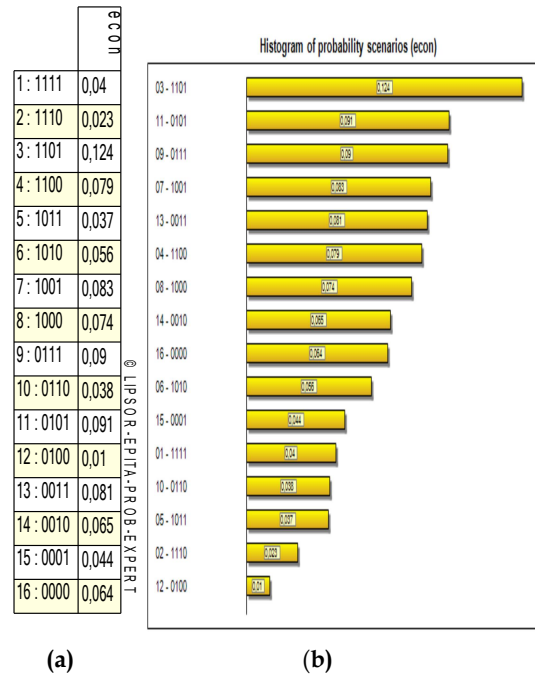
	usual	komersial	increase	decrease
1 : usual	0	0,496	0,632	0,569
2 : komersial	0,475	0	0,535	0,367
3 : increase	0,567	0,475	0	0,445
4 : decrease	0,635	0,486	0,601	0

b. (p_{i/j})

Figure 3. Clean data for conditional opportunities: realized (a) and unrealized (b)

To see the ranking of possible scenario combinations, which produce 2ⁿ combinations where n in this study is 4 possible scenarios, so there are 16 scenario combinations as shown in Figure 4. The number "1" and the number "0" in each combination indicates whether the

scenario is realized or not. As shown in Figure 4 (a), the first combination is 1111 which has a probability of 0.04 (4%), which means that the four scenarios hypothesized by the actions of craftsmen have a very small chance of being implemented..



(a) (b)
 Figure 4. Possible scenarios (a) and The sequence of Scenario Combinations Based on Probability Size (b)

Meanwhile, the one with the highest international events such as the G20 probability of the alternative combination is Presidency.

combination 03: namely 1101, which is 0.124 **Impact Between Scenarios**

(12.4%), which means that the combination The hypothesis/scenario of the scenario of craftsmen continuing to produce as craftsman's actions being realized or not usual (usual), besides the scenario there is realized will have an impact on other another namely business (commercial side), hypotheses/scenarios (Figure 5). Figure 5(a) and reducing production (decrease) is 12.4%. shows that if the scenario of the craftsmen This is in accordance with the results of producing as usual is realized, then the chance questionnaires, FGDs, and in-depth interviews of the craftsmen increasing production will with elders. Craftsmen maintain traditions that decrease by 15.2%, and the chance of the have existed for generations, but there are also craftsmen reducing production will decrease by craftsmen who follow tourism developments, 3.6%. especially as receiving visits or taking part in

	usual	komersial	increase	decrease
1 : usual	0	0,02	-0,152	-0,036
2 : komersial	0,02	0	-0,051	0,089
3 : increase	-0,127	-0,045	0	-0,01
4 : decrease	-0,041	0,107	-0,013	0

(a). $P(i/j) - P(i)$

	usual	komersial	increase	decrease
1 : usual	-0,516	-0,02	0,115	0,052
2 : komersial	-0,021	-0,496	0,039	-0,129
3 : increase	0,136	0,044	-0,431	0,014
4 : decrease	0,044	-0,105	0,01	-0,591

(b). $(p_{i/j}) - P(i)$

Figure 5. Impact of Realized Scenarios (a), dan Impact of Unrealized Scenario (b) to Other Scenario Opportunities

The figure -0.152 is the result of calculating the difference between the conditional probability and simple probability from net data, namely $P(i/j)$ or craftsmen to produce as usual to increase production by 0.364 (figure 3a) minus the usual $P(i)$ of 0.516 = -0.152. Figure 3(b) shows that if scenario i is not realized and the impact on scenario j. For example, if craftsmen with a commercial side are not realized, the chances of craftsmen producing as usual decrease by 0.021. This figure is the difference from $(p_{i/j})$ or “commercial” to “usual” of 0.475 (Fig. 3b) minus $p(i)$ for commercial of 0.496 (Fig. 2 Net data).

Sensitivity Analysis of Scenarios Driving Sustainability of the Grinsing Weaving Industry

Sensitivity analysis of SMIC-Prob results is measured by elasticity, namely how responsive changes in opportunities are from one scenario to another. The results of the elasticity analysis in this study are shown in Figure 6. The last column is the absolute value of elasticity for each scenario (horizontal summation) which can be interpreted as the "prime mover" or the main mover of the existing system and the last row (vertical summation) can be said to be a scenario or conditional action..

	usual	komersial	increase	decrease	Absolute value
1 : usual	1	-0,366	-0,624	-0,443	1,432
2 : komersial	-0,284	1	-0,369	-0,196	0,849
3 : increase	-0,467	-0,376	1	-0,333	1,176
4 : decrease	-0,484	-0,203	-0,429	1	1,116
5 : Absolute value	1,235	0,945	1,422	0,972	—

Figure 6. Scenario Elasticity

The scenario of craftsmen producing as usual and increasing production is a "prime mover" with the respective elasticities of 1.432 and 1.176, which means that the desire for Grinsing weaving will be largely determined by the two scenarios.

In fact, the craftsmen were still producing as usual, and that was what happened most. This is because weaving is a work passed down from generation to generation. Meanwhile, in the last row, the scenario of increasing production is most influenced with an elasticity of 1.422 and the biggest contributor is from the usual scenario to an increase of -0.624. This means that if the opportunity for craftsmen to produce as usual increases by 100%, then the opportunity for craftsmen to increase production will decrease by 0.624 (62.4%).

DISCUSSION

Grinsing weaving as a form of culture-based creative industry has had various challenges in its long history. Based on the analysis, it was found that Grinsing's weaving opportunities can be done with several options, including continuing to produce, doing other businesses besides production, and reducing production.

Craftsmen continue to produce to maintain their business as a source of livelihood. Grinsing woven products are products that contain cultural and spiritual values. Grinsing woven is more widely used for traditional and religious activities, especially Hinduism. Thus, the existence of Grinsing fabric is still needed by the market even though the available market is still limited.

Grinsing weaving craftsmen can expand their market by conducting other business activities. In general, the marketing of Grinsing weaving is carried out in the homes of each craftsman. Under such circumstances, product access to consumers will be limited. The form of market expansion required by craftsmen is to introduce their products with wider methods and media, such as opening shops/displays outside the Tenganan Village environment so that they are more accessible to potential consumers. On the other hand, it is also necessary to expand promotional media by using technology such as e-commerce or participating in exhibitions organized by third parties, including the government.

On the other hand, there is also an opportunity to reduce production with the aim of making Grinsing weaving an exclusive limited item. The mechanism is that rare items will have a higher value (price). In such conditions, it is very possible that the price of Grinsing cloth is not only determined by customary/religious needs but also sought because of consumer preference for high-quality goods. Thus, demand for Grinsing fabric will be more determined by consumer tastes.

CONCLUSION

Based on the results and discussion of the research, several things can be concluded as

follows: first, the combination of craftsmen's action scenarios with the highest chance is combination 1101, namely the craftsmen persist in production as usual (usual), carry out a commercial side, and the craftsmen reduce production (decrease). Second, the sensitivity analysis shows that the scenario of craftsmen producing as usual and increasing production is the "prime mover", and the scenario of increasing production is a scenario that is heavily influenced, where the biggest contributor is from normal to increase.

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